Agilent 7100 Capillary Electrophoresis System

User Manual

Agilent Technologies

Notices

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WARNING

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Research Use Only

In This Guide...

This guide contains information to install and operate the Agilent 7100 Capillary Electrophoresis System.

1 Introduction

This chapter gives an introduction to the instrument, instrument overview and internal connectors.

2 Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

3 Installing the Instrument

In this chapter you will find information about how to unpack and to set up the Agilent CE and information about the configuration of Instrument.

4 LAN Configuration

This chapter provides information on connecting the CE instrument to the Agilent ChemStation PC.

5 Using the Agilent 7100 Capillary Electrophoresis System

This chapter provides information on how to set up the CE instrument for an analysis and explains the basic settings.

6 Troubleshooting and Diagnostics

This chapter gives an overview about the troubleshooting and diagnostic features and the different user interfaces.

7 Hardware Information

This chapter describes the instrument in more detail on hardware and electronics.

8 Maintenance

This chapter describes the maintenance of the CE instrument.

9 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

10 Appendix

This chapter provides additional information on safety, legal and web content associated with your 7100 CE instrument.

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1 Introduction

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This chapter gives an introduction to the Agilent 7100 Capillary Electrophoresis System and where to find specific information or help.

Introduction to the Agilent 7100 Capillary Electrophoresis System

This handbook gives an overview of your Agilent 7100 Capillary Electrophoresis System. It is designed to get you started working with the system. We strongly advise you to make extensive use of the online help when working with the system. There you find detailed reference and task information which complements the overview given in this guide. Refer to "Getting Help" later in this section for information on using the online help of the ChemStation. Refer to "Where to Find Information" for help in finding information on certain tasks.

Getting Help

You can get help by choosing the **Help** item from the top menu. This puts you into the help index. From there you can browse through the information by selecting the appropriate jumps (underlined words). To access specific information in the help:

When you are in the Agilent ChemStation or Lab Advisor software:

- select a context-sensitive element and press F1.

When you are in the online help:

- search for a specific keyword using the search command,
- select a jump - a jump is an underlined word you can select to go to a topic related to the word, or
- select a word or phrase with a dotted underline to see its definition. The online help also contains online information on how to use help.

Where to Find Information

Table 1 Where to find information

Task	Refer to
• Installation of the Agilent CE System, installing the external water bath, installing the high sensitivity cell	"The Core Agilent CE Instrument" "Installing the Instrument" on page 53
• Setting up the Agilent CE System for CE analysis, CE+p	Chapter "Using the Agilent 7100 Capillary Electrophoresis System" on page 77"
• How to use the Agilent CE System in the CE+p mode	"Capillary Electrophoresis, Plus High Pressure CE+p" on page 136
• How to use the Agilent CE System for capillary electrochromatography	"Capillary Electrochromatography, CEC" on page 148
• How to maintain the Agilent CE System	Chapter "Maintenance" on page 189
• Setting up a sequence	Online help *"Understanding Your ChemStation"*
• Data analysis	Online help *"Understanding Your ChemStation"*
• Setting up a report	Online help *"Understanding Your ChemStation"*
• Spectral library search	*"ChemStation Applications"* handbook and online help
• Setting up customized reports	*"ChemStation Applications"* handbook
• Safety information	Safety information in "Appendix" on page 231
• Learning ChemStation concepts	*"Understanding Your ChemStation"* handbook
• Learning the theory of the technique	*High Performance Capillary Electrophoresis: An Introduction"* The CE Partner CD-ROM: "*The comprehensive, interactive tool for beginners and advanced users of CE"*
• Application	Agilent web page (http://www.agilent.com), search for Application notes

What Learning Products are Available?

The Agilent CE System is supplied with the following:

- User's Guide
- High Performance Capillary Electrophoresis: An Introduction

The Agilent ChemStation and Lab Advisor/Instrument Utilities software DVD is supplied with the following electronic documents:

- Installing Your Agilent ChemStation for LC and CE Systems
- Installing and Understanding Your Spectra Module
- Understanding Your Agilent ChemStation
- Online help
- Understanding Your Agilent ChemStation for CE Systems

2
Site Requirements and Specifications

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This chapter provides information on the environmental requirements, as well as physical and performance specifications.

Site Requirements

A suitable environment is important to ensure optimal performance of the 7100 Capillary Electrophoresis instrument.

Before you begin installation, check carefully that the place you have chosen meets the requirements below.

Power Consideration

The instrument power supply has wide ranging capabilities and accepts any standard line voltage in the range mentioned in Table 2 on page 21. Consequently, there is no voltage selector on the back of the detector.

WARNING

The module is partially energized when switched off, as long as the power cord is plugged in.

Repair or maintenance work on the module can lead to personal injuries, for example a shock hazard, when the cover is opened and the module is connected to the power.

- Make sure that it is always possible to access the power plug.
- Remove the power cable from the instrument before opening the cover.
- Do not connect the power cable to the instrument while the electronic box in the back of the instrument is opened or side panels are removed.

WARNING

Incorrect line voltage on the instrument

Shock hazard or damage to your instrument can result if the device is connected to a line voltage that is higher than specified.

- Connect your instrument to the specified line voltage.

CAUTION

Inaccessible power plug.

In the case of an emergency it must be possible to disconnect the instrument from the power line at any time.

- Make sure the power connector of the instrument can be easily reached and unplugged.
- Provide sufficient space behind the power socket of the instrument to unplug the cable.

Power Cords

Different power cords are delivered with the instrument. The female end of all power cords is identical. It plugs into the power-input socket at the rear. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

WARNING

Absence of a ground connection or use of an unspecified power cord

The absence of a ground connection or the use of an unspecified power cord can lead to an electric shock or short circuit.

- Never operate your instrument from a power outlet without a ground connection.
- Never use a power cord other than the Agilent Technologies power cord designed for your region.

WARNING

Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

- Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Bench Space

The instrument dimensions and weight mean that the instrument can be placed on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inch) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the Agilent 7100 Capillary Electrophoresis instrument is to be placed on a bench, make sure that the bench is designed to bear the weight of the system.

The instrument must be operated in a upright position.

Environment

Your instrument will work within the specifications for ambient temperatures and relative humidity described in Table 2 on page 21.

CAUTION

Condensation within the module

Condensation will damage the system electronics.

- Do not store, ship or use your module under conditions where temperature fluctuations could cause condensation within the module.
- If your module was shipped in cold weather, leave it in its box and allow it to warm slowly to room temperature to avoid condensation.

Physical Specifications

Table 2 Physical specifications

Type	Specification	Comments
Weight	35 kg (77.2 lbs)	
Dimensions (width × depth × height)	350 x 510 x 590 mm (13.8 x 20.1 x 23.2 inches)	
Line voltage	100–240 VAC ± 10%	Wide-ranging capability
Line frequency	50 or 60 Hz ± 5%	
Power consumption	350 VA / 300 W / 1024 BTU/h	Maximum
Ambient operating temperature	5–40 °C (41–104 °F)	
Ambient non-operating temperature	-40 to 70°C (-40 to 158 °F)	
Humidity	below 80% at 31 °C (87.8 °F)	Non-condensing
Operating altitude	Up to 2000 m (6500 ft)	
External cooling	max. 0.5 bar (7.2 psi), max. 50 °C (122 °F)	Waterbath
External pressure	2-12 bar (29-174 psi)	Oil-free air or nitrogen
Safety standards: IEC, CSA, UL	Installation category II, Pollution degree 2	For indoor use only
Housing	All materials are recyclable	

For applications run in CEC mode (Capillary Electrochromatography) or CE+p mode (Capillary Electrophoresis mode with optional usage of higher pressure), an external pressure supply of oil-free air or nitrogen with a maximum pressure of 15 bar (218 psi) can be used. A respective male adapter that fits into the instrument's female adapter and PTFE tubing are part of the shipment.

NOTE

The Agilent 7100 Capillary Electrophoresis System is designed to operate in a typical electromagnetic environment where RF transmitters, such as mobile phones, should not be used in close proximity.

Performance Specifications

Table 3 Performance specifications for the Agilent 7100 Capillary Electrophoresis System

Type	Specification	Comments
Safety features	Extensive diagnostics, error detection and display, current leak detection; low current limit Liquid leak sensor; safety sensors on door and cover disabling high voltage; vial sensor;	
Control and data evaluation	Agilent ChemStation under Windows® XP (SP3)	
Communication	LAN, controller-area network (CAN), RS-232C, APG remote: ready, start, stop and shut-down signals. USB (future use). Analog out and in.	0 to1 V
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors	

Anforderungen an den Aufstellungsort

Eine geeignete Umgebung ist wichtig für die optimale Leistungsfähigkeit des 7100 Kapillarelektrophorese-Geräts.

Prüfen Sie sorgfältig, ob der von Ihnen gewählte Aufstellort die nachfolgenden Anforderungen erfüllt, bevor Sie mit der Installation beginnen.

Stromversorgung

Das Weitbereichsnetzteil des Geräts arbeitet mit Standard-Netzspannungen gemäß den Angaben in Tabelle 4 auf Seite 26. Daher ist an der Rückseite des Detektors kein Spannungswahlschalter vorhanden.

WARNUNG

Auch im ausgeschalteten Zustand fließt im Modul Strom, solange das Netzkabel eingesteckt ist.

Die Durchführung von Reparatur- oder Wartungsarbeiten am Modul kann zu Personenschäden wie z. B. durch Stromschlag führen, wenn das Modulgehäuse geöffnet wird, während das Modul an die Netzspannung angeschlossen ist.

- Stellen Sie den freien Zugang zu den Netzkabeln sicher.
- Trennen Sie das Netzkabel vom Gerät, bevor Sie das Gehäuse öffnen.
- Schließen Sie das Netzkabel nicht an das Gerät an, während der Elektronikkasten an der Geräterückseite geöffnet oder Seitenteile entfernt sind.

WARNUNG

Falsche Netzspannung am Gerät

Wenn das Gerät an eine höhere Spannung als spezifiziert angeschlossen wird, kann dies zu Überspannungsschäden oder einer völligen Zerstörung des Geräts führen.

- Schließen Sie das Gerät an die angegebene Netzspannung an.

VORSICHT

Unzugänglicher Netzstecker.

In einem Notfall muss es jederzeit möglich sein, das Gerät vom Stromnetz zu trennen.

- Stellen Sie sicher, dass der Netzstecker des Geräts leicht zugänglich ist.
- Lassen Sie hinter der Netzbuchse des Geräts genügend Platz zum Herausziehen des Kabels.

Netzkabel

Das Gerät wird mit unterschiedlichen Netzkabeln ausgeliefert. Der weibliche Stecker ist bei jedem Netzkabel identisch. Er wird an die Netzanschlussbuchse an der Rückseite angeschlossen. Die Stecker am anderen Ende der Netzkabel sind unterschiedlich und erfüllen die Normen unterschiedlicher Länder oder Regionen.

WARNUNG

Nicht vorhandene Erdung oder Verwendung eines nicht spezifizierten Netzkabels

Bei der Verwendung des Geräts ohne Erdung oder mit einem nicht spezifizierten Netzkabel können Stromschläge und Kurzschlüsse auftreten.

- Betreiben Sie Ihr Gerät niemals an einer Spannungsquelle ohne Erdung.
- Verwenden Sie niemals ein anderes als das von Agilent zum Einsatz im jeweiligen Land bereitgestellte Kabel.

WARNUNG

Verwendung nicht im Lieferumfang enthaltener Kabel

Die Verwendung von Kabeln, die nicht von Agilent Technologies geliefert wurden, kann zu einer Beschädigung der elektronischen Komponenten oder zu Personenschäden führen.

- Verwenden Sie ausschließlich Originalkabel von Agilent Technologies, um eine einwandfreie Funktion und die Einhaltung der Sicherheits- und EML-Bestimmungen zu gewährleisten.

Platzbedarf

Die Abmessungen und das Gewicht des Geräts ermöglichen seine Aufstellung auf praktisch jedem Schreibtisch oder Laborarbeitstisch. Das Gerät benötigt an jeder Seite zusätzlich 2,5 cm Platz und ungefähr 8 cm an der Rückseite für die elektrischen Anschlüsse und für eine ausreichende Luftzirkulation.

Wenn das Agilent 7100 Kapillarelektrophorese System auf einem Labortisch aufgestellt werden soll, stellen Sie sicher, dass der Tisch ausreichende Tragfähigkeit für das System aufweist.

Das Gerät ist stehend zu betreiben!

Umgebungsbedingungen

Ihr Gerät arbeitet bei der Umgebungstemperatur und der relativen Luftfeuchtigkeit, die in den Spezifikationen in Tabelle 4 auf Seite 26 angegeben sind.

VORSICHT

Kondensation im Inneren des Moduls

Kondensation führt zur Beschädigung der Systemelektronik.

- Vermeiden Sie die Lagerung, den Versand oder den Betrieb der Pumpe unter Bedingungen, die zu einer Kondensation in der Pumpe führen können.
- Nach einem Transport bei niedrigen Temperaturen muss das Gerät zur Vermeidung von Kondensation in der Verpackung verbleiben, bis es sich auf Raumtemperatur erwärmt hat.

Abmessungen und Gewicht

Tabelle 4 Abmessungen und Gewicht

Typ	Spezifikationen	Kommentare
Gewicht	35 kg	
Abmessungen (Breite × Tiefe × Höhe)	350 x 510 x 590 mm (23,2 x 13,8 x 20,1 Zoll)	
Netzspannung	100–240 V Wechselstrom ± 10 %	Weitbereichsnetzteil
Netzfrequenz	50 oder 60 Hz ± 5 %	
Leistungsaufnahme	350 VA / 300 W / 1024 BTU/h	Maximal
zulässige Umgebungstemperatur bei Lagerung	5–40 °C	
Umgebungstemperatur bei Lagerung	-40 bis 70 °C	
Luftfeuchtigkeit	unter 80 % bei 31 °C	Nicht kondensierend
Betriebshöhe	bis zu 2000 m	
Externe Kühlung	max. 0,5 bar (7,2 psi), max. 50 °C	Wasserbad
Externer Druck	2-12 bar (29-174 psi)	Ölfreie Luft oder Stickstoff
Sicherheitsstandards: IEC, CSA, UL	Installationskategorie II, Verschmutzungsgrad 2.	Nur für den Einsatz im Innenbereich geeignet
Gehäuse	Alle Materialien sind recyclebar.	

Für Applikationen im CEC-Modus (Capillary Electrochromatography) oder CE+p-Modus (Kapillarelektrophorese-Modus mit optionaler Verwendung höheren Druckes) kann eine externe Druckversorgung mit ölfreier Luft oder Stickstoff und einem Druckmaximum von 15 bar (218 psi) verwendet werden. Ein entsprechender männlicher Adapter für den weiblichen Adapter des Geräts und PTFE-Schläuche werden mitgeliefert.

HINWEIS

Das Agilent 7100 Kapillarelektrophorese-System ist auf den Betrieb in einer typischen elektromagnetischen Umgebung ausgelegt, in deren unmittelbarer Nähe keine HF-Sender wie z. B. Mobiltelefone verwendet werden dürfen.

Leistungsspezifikationen

Tabelle 5 Leistungsspezifikationen für das Agilent 7100 Kapillarelektrophorese-System

Typ	Spezifikationen	Kommentare
Sicherheitsvorkehrungen	Umfangreiche Diagnose, Fehlererkennung und -anzeige, Kriechstromerkennung; Grenzwert für zu niedrigen Strom Flüssigkeitslecksensor; Sicherheitssensoren an Tür und Abdeckung zur Trennung der Hochspannung; Probenflaschensensor;	
Steuerung und Datenauswertung	Agilent ChemStation unter Windows® XP (SP3)	
Kommunikation	LAN, CAN (Controller-Area Network), RS-232C, APG Remote: Ready-, Start-, Stop- und Shut-down-Signale. USB (zukünftige Verwendung). Analoger Ein-/Ausgang.	0 bis 1 V
GLP-Eigenschaften	Frühwarnsystem für fällige Wartungen (EMF, Early Maintenance Feedback), elektronische Aufzeichnung von Wartungsarbeiten und Fehlermeldungen	

Exigences d'installation

Un environnement adéquat est indispensable pour obtenir des performances optimales de l'instrument d'électrophorèse capillaire 7100.

Avant de commencer l'installation, vérifiez soigneusement que l'emplacement choisi est conforme aux exigences ci-dessous.

Remarques à propos de l'alimentation

Le module d'alimentation de l'instrument présente une tolérance importante. Il accepte ainsi n'importe quelle tension de secteur se situant dans la plage de tolérance précisée dans le Tableau 6, page 31. Ceci explique l'absence de sélecteur de tension à l'arrière du détecteur.

AVERTISSEMENT

Le module reste partiellement activé lorsqu'il est éteint, tant que le cordon d'alimentation est branché.

Certaines opérations de réparation ou d'entretien sur le module peuvent occasionner des blessures, par exemple l'électrocution, si le capot est ouvert et que le module est branché.

- Veillez à ce que la prise d'alimentation électrique reste à tout moment accessible.
- Débranchez le câble d'alimentation de l'instrument avant d'ouvrir le capot.
- Ne branchez pas le câble d'alimentation sur l'instrument si le boîtier électronique à l'arrière est ouvert ou si les panneaux latéraux sont enlevés.

AVERTISSEMENT

Tension de secteur incorrecte au niveau de l'instrument

Il existe un risque d'électrocution ou de dommages à l'instrument en cas de raccordement à une ligne d'alimentation de tension supérieure à celle spécifiée.

- Connectez l'instrument à la tension indiquée.

ATTENTION

Prise d'alimentation inaccessible.

En cas d'urgence, il doit être possible de débrancher à tout moment l'instrument du secteur.

- Veillez à faciliter l'accès au connecteur d'alimentation de l'instrument et à permettre de le débrancher facilement.
- Maintenez un espace suffisant derrière la prise d'alimentation de l'instrument pour pouvoir débrancher le câble.

Câbles d'alimentation

Différents câbles d'alimentation sont livrés avec l'instrument. L'extrémité femelle est la même pour tous les câbles. Elle s'enfiche dans l'embase d'alimentation située à l'arrière. L'extrémité mâle, qui se branche sur la prise de courant murale, varie selon le pays ou la région.

AVERTISSEMENT

Absence de raccordement à la terre et utilisation d'un câble d'alimentation non adapté

L'absence de raccordement à la terre et l'utilisation d'un câble d'alimentation non adapté peuvent entraîner une électrocution ou un court-circuit.

- N'utilisez jamais une prise de courant sans mise à la terre.
- N'utilisez jamais de câble d'alimentation autre que le modèle Agilent Technologies destiné à votre pays.

AVERTISSEMENT

Utilisation de câbles non fournis

L'utilisation de câbles non fournis par Agilent Technologies pourrait endommager les composants électroniques ou provoquer des blessures.

- Pour garantir un bon fonctionnement et le respect des règles de sécurité ou de compatibilité électromagnétique, n'utilisez jamais d'autres câbles que ceux fournis par Agilent Technologies.

Encombrement

Les dimensions et le poids de l'instrument permettent un placement sur quasiment n'importe quel bureau ou paillasse de laboratoire. Veillez à prévoir un dégagement de 2,5 cm de part et d'autre et d'environ 8 cm à l'arrière pour assurer la circulation de l'air et le passage des raccordements électriques

Si le système d'électrophorèse capillaire Agilent 7100 doit être placé sur une paillasse, assurez-vous que celle-ci est conçue pour supporter le poids du système.

En fonctionnement, l'instrument doit être en position verticale.

Environnement

Votre instrument fonctionnera conformément aux spécifications dans les conditions de température ambiante et d'humidité relative précisées dans le Tableau 6, page 31.

ATTENTION

Condensation à l'intérieur du module

La condensation endommage les circuits électroniques du système.

- N'entreposez pas, ne transportez pas et n'utilisez pas votre module dans des conditions où les fluctuations de température risqueraient de provoquer de la condensation à l'intérieur du module.
- Si le module a été transporté par temps froid, ne le sortez directement pas de son emballage : laissez-le atteindre progressivement la température ambiante pour éviter toute condensation.

Caractéristiques physiques

Tableau 6 Caractéristiques physiques

Type	Caractéristique	Commentaires
Poids	35 kg	
Dimensions (largeur × profondeur × hauteur)	350 x 510 x 590 mm	
Tension secteur	100–240 V CA ± 10 %	Plage de tensions étendue
Fréquence secteur	50 ou 60 Hz ± 5 %	
Puissance consommée	350 VA / 300 W / 1 024 BTU/h	Maximum
Température ambiante hors fonctionnement	5–40 °C	
Température ambiante hors fonctionnement	-40 à 70 °C	
Humidité	Inférieure à 80 % à 31 °C	Sans condensation
Altitude de fonctionnement	Jusqu'à 2 000 m	
Refroidissement extérieur	Max. 0,5 bar, max. 50 °C	Bain-marie
Pression extérieure	2-12 bar	Air ou azote sans hydrocarbures
Normes de sécurité : CEI, CSA, UL	Catégorie d'installation II, degré de pollution 2.	Utilisation intérieure uniquement
Boîtier	Tous les matériaux sont recyclables	

Pour les applications fonctionnant en mode ECC (électrochromatographie capillaire) ou en mode EC+p (mode d'électrophorèse capillaire avec utilisation optionnelle de pression supérieure), une alimentation en pression extérieure d'air ou d'azote sans hydrocarbures à une pression maximale de 15 bar peut être utilisée. Un adaptateur mâle respectif adapté à l'adaptateur femelle de l'instrument et des tuyaux PTFE sont livrés avec l'instrument.

REMARQUE

Le système d'électrophorèse capillaire Agilent 7100 est conçu pour fonctionner dans un environnement électromagnétique usuel, dans lequel des émetteurs de radiofréquences, tels que les téléphones mobiles, ne doivent pas être utilisés à proximité.

Caractéristiques de performance

Tableau 7 Caractéristiques de performance du système d'électrophorèse capillaire Agilent 7100

Type	Caractéristique	Commentaires
Fonctions de sécurité	Diagnostic étendu, détection et affichage des erreurs, détection du courant de fuite ; limite de courant faible Détecteur de fuites ; capteurs de sécurité sur la porte et le couvercle, avec fonction de désactivation de haute tension ; capteur de flacons ;	
Commande et traitement des données	Agilent ChemStation sous Windows® XP (SP3)	
Communication	Réseau local, bus CAN, RS-232C, commande à distance CAG : signaux ready, start, stop et shut-down. USB (utilisation ultérieure). Sortie et entrée analogiques	0 à 1 V
Caractéristiques BPL	Maintenance prédictive (EMF), enregistrement électronique des opérations de maintenance et des erreurs	

Requisiti ambientali

Un ambiente adatto è importante per garantire le prestazioni ottimali del Sistema per elettroforesi capillare Agilent 7100.

Prima di effettuare l'installazione, controllare attentamente che il luogo scelto per l'installazione soddisfi i requisiti indicati di seguito.

Alimentazione

Lo strumento può essere utilizzato in un ampio intervallo di valori di tensione ed è in grado di accettare tensioni di linea compresi negli intervalli indicati nella Tavola 8 a pagina 36. Pertanto, nella parte posteriore del rivelatore non è presente alcun selettore di frequenza.

ATTENZIONE

Quando è spento, se il cavo di alimentazione è collegato, il modulo riceve parzialmente energia.

Gli interventi di riparazione o manutenzione del modulo possono provocare lesioni personali, come scosse elettriche, nel caso in cui il coperchio sia aperto e il modulo sia collegato all'alimentazione.

- Verificare che sia sempre possibile accedere alla presa di alimentazione.
- Scollegare il cavo di alimentazione dallo strumento prima di aprire il coperchio.
- Non collegare il cavo di alimentazione dello strumento se l'alloggiamento dell'elettronica sul retro dello strumento è aperto o se i pannelli laterali sono stati rimossi.

ATTENZIONE

Tensione di linea non corretta nello strumento

Se gli strumenti vengono collegati a una tensione più elevata di quella prevista, esiste il rischio di danneggiarli.

- Collegare lo strumento alla tensione di linea specificata.

AVVERTENZA

Presa di alimentazione inaccessibile.

In caso di emergenza, deve essere possibile scollegare lo strumento dalla rete elettrica in qualsiasi momento.

- Accertarsi che il connettore di alimentazione dello strumento sia accessibile e possa essere scollegato facilmente.
- Verificare che lo spazio dietro la presa di alimentazione dello strumento sia sufficiente per consentire lo scollegamento del cavo.

Cavi di alimentazione

Lo strumento viene fornito con cavi di alimentazione diversi. L'estremità femmina è sempre uguale e deve essere introdotta nell'apposita presa di alimentazione che si trova nella parte posteriore. L'estremità maschio di ciascun cavo di alimentazione è diversa ed è progettata per adattarsi alle prese utilizzate nei vari paesi.

ATTENZIONE

Assenza di messa a terra o uso di un cavo di alimentazione non specificato

L'assenza del collegamento a terra o l'uso di un cavo di alimentazione non specificato può provocare scosse elettriche o cortocircuiti.

- Non utilizzare mai lo strumento con prese prive di messa a terra.
- Non utilizzare cavi di alimentazione diversi da quelli predisposti da Agilent Technologies per i singoli paesi.

ATTENZIONE

Uso di cavi non forniti

L'uso di cavi non forniti da Agilent Technologies può provocare danni ai componenti elettronici o lesioni personali.

- Utilizzare solo cavi forniti da Agilent Technologies, in modo da assicurare il funzionamento corretto e la conformità alle norme di sicurezza o alle normative EMC.

Spazio necessario

Le dimensioni e il peso dello strumento ne consentono il posizionamento sulla maggior parte dei banchi o tavoli di laboratorio. È necessario lasciare un ulteriore spazio di 2,5 cm su entrambi i lati e di circa 8 cm nella parte posteriore per la circolazione dell'aria.

Se si posiziona sul banco l'intero Sistema per elettroforesi capillare Agilent 7100, assicurarsi che il banco sia in grado di sostenere il peso complessivo del sistema.

Lo strumento deve essere usato in posizione verticale.

Ambiente

Lo strumento è progettato per essere usato nelle condizioni di temperatura ambientale e umidità specifiche descritte nella Tavola 8 a pagina 36.

AVVERTENZA

Condensa all'interno del modulo

La condensa danneggia i componenti elettronici del sistema.

- Non immagazzinare, trasportare o utilizzare il modulo in condizioni in cui eventuali variazioni di temperatura potrebbero causare la formazione di condensa al suo interno.
- Se il modulo è stato spedito in condizioni di bassa temperatura, lasciarlo nel contenitore di imballaggio per consentirgli di raggiungere lentamente la temperatura ambiente ed evitare la formazione di condensa.

Specifiche fisiche

Tavola 8 Specifiche fisiche

Tipo	Specifica	Commenti
Peso	35 kg	
Dimensioni (larghezza × profondità × altezza)	350 x 510 x 590 mm	
Tensione di rete	100–240 VCA ± 10%	Diversi valori di tensione accettati
Frequenza di rete	50 o 60 Hz ± 5%	
Consumo elettrico	350 VA / 300 W / 1024 BTU/h	Massimo
Temperatura ambiente non operativa	5–40 °C	
Temperatura ambiente non operativa	Da -40 a 70°C	
Umidità	Inferiore all'80% a una temperatura di 31 °C	Assenza di condensa
Altitudine operativa	Fino a 2.000 m	
Raffreddamento esterno	Max 0,5 bar , max 50 °C	Bagno d'acqua
Pressione esterna	2-12 bar	Aria priva di olio o azoto
Standard di sicurezza: IEC, CSA, UL	Categoria di installazione II, grado di inquinamento 2.	Solo per uso all'interno
Involucri	Tutti i materiali sono riciclabili	

Per le applicazioni in modalità CEC (elettrocromatografia capillare) o CE+p (elettrocromatografia capillare con utilizzo opzionale di alta pressione), è possibile usare un sistema esterno per alimentare aria priva di olii o azoto a una pressione massima di 15 bar. Insieme al prodotto viene fornito un adattatore maschio che si inserisce nell'adattatore femmina dello strumento e tubi in PTFE.

NOTA

Il Sistema per elettroforesi capillare Agilent 7100 è concepito per operare in un tipico ambiente elettromagnetico nelle cui vicinanze non devono essere presenti trasmettitori RF, come telefoni cellulari.

Specifiche delle prestazioni

Tavola 9 Specifiche delle prestazioni del Sistema per elettroforesi capillare Agilent 7100

Tipo	Specifica	Commenti
Dispositivi di sicurezza	Ampia scelta di funzionalità diagnostiche, identificazione e visualizzazione degli errori, rilevamento di perdite di corrente, limite di corrente basso Sensore per il rilevamento di perdite di liquidi, sensori di sicurezza sullo sportello e il coperchio per disabilitare l'alta tensione, sensore per vial	
Controllo e valutazione dei dati	Agilent ChemStation per Windows® XP (SP3)	
Comunicazioni	Controller LAN (rete area controllore), RS-232C, APG remoto: segnali di pronto, avvio, arresto e interruzione (ready, start, stop e shut-down) USB (per un uso futuro). Uscita e ingresso analogici	Da 0 a 1 V
Funzioni GLP	Avviso di manutenzione preventiva (Early maintenance feedback, EMF), registro elettronico della manutenzione e degli errori	

Requisitos de las instalaciones

Es importante disponer de un entorno adecuado para lograr un óptimo rendimiento del sistema de electroforesis capilar 7100.

Antes de comenzar la instalación, compruebe minuciosamente que el lugar elegido cumple los requisitos citados a continuación.

Consideraciones sobre la corriente

La fuente de alimentación del instrumento tiene un amplio rango de capacidades y admite cualquier voltaje de línea estándar en el rango especificado en la Tabla 10 de la página 41. Por lo tanto, no hay ningún selector de voltaje en la parte posterior del detector.

ADVERTENCIA

Mientras el cable de alimentación esté conectado, el módulo sigue recibiendo corriente aunque esté apagado.

Las tareas de reparación o mantenimiento del módulo entrañan riesgos de lesiones personales, como descargas, si se abre la cubierta del instrumento mientras éste permanece conectado a la corriente.

- Asegúrese de poder acceder siempre al enchufe de corriente.
- Retire el cable de corriente del instrumento antes de abrir la cubierta del módulo.
- No conecte el cable de alimentación al instrumento si la caja de la electrónica de la parte trasera está abierta o si se han retirado los paneles laterales.

ADVERTENCIA

Voltaje de línea incorrecto en el instrumento

Si el instrumento se conecta a un voltaje superior al especificado, existe peligro de electrocución o de daños en los instrumentos.

- Conecte el instrumento al voltaje de línea especificado.

PRECAUCIÓN Enchufe de alimentación inaccesible.

En caso de emergencia, debe ser posible desconectar el instrumento de la red inmediatamente.

- Asegúrese de que es posible alcanzar y desconectar fácilmente el enchufe del instrumento.
- Deje espacio suficiente por detrás de la toma de corriente del instrumento para desconectar el cable.

Cables de alimentación

El instrumento se entrega con diferentes cables de alimentación.
Los terminales hembra de todos los cables de alimentación son idénticos.
Se introducen en el conector de entrada de corriente de la parte posterior.
El terminal macho de cada cable de alimentación es diferente y está diseñado acorde con los enchufes de cada país o región.

ADVERTENCIA **Conexión a tierra inexistente o uso de un cable de alimentación no especificado**

La falta de toma de tierra y el uso de un cable de alimentación no especificado pueden provocar electrocución o cortocircuitos.

- No utilice nunca el instrumento con una toma de corriente sin conexión a tierra.
- No utilice nunca un cable de alimentación distinto del suministrado por Agilent Technologies diseñado para su región.

ADVERTENCIA **Uso de cables no suministrados**

El uso de cables no suministrados por Agilent Technologies puede producir lesiones personales o daños en los componentes electrónicos.

- Para asegurar un funcionamiento correcto y el cumplimiento de los reglamentos de seguridad o de compatibilidad electromagnética, no utilice nunca cables distintos de los suministrados por Agilent Technologies.

Espacio en el banco

Las dimensiones y el peso del instrumento facilitan su colocación sobre prácticamente cualquier mesa de laboratorio. Deben dejarse unos 2,5 cm libres a cada lado y unos 8 cm en la parte posterior para la circulación del aire y las conexiones eléctricas.

En caso de colocar el Instrumento de Electroforesis Capilar Agilent 7100 en un banco, confirme que éste pueda soportar el peso del sistema.

El instrumento se debe utilizar en posición vertical.

Entorno

El instrumento funcionará dentro de las especificaciones de temperatura ambiente y humedad relativa descritas en la Tabla 10 de la página 41.

PRECAUCIÓN Condensación dentro del módulo

La condensación dañará la electrónica del sistema.

- No guarde, traslade ni utilice el módulo bajo condiciones en las que las fluctuaciones de temperatura pudieran provocar condensación dentro del módulo.
- Si el traslado del módulo se realizó bajo condiciones ambientales frías, manténgalo en su caja hasta que alcance lentamente la temperatura ambiente, para evitar problemas de condensación.

Especificaciones físicas

Tabla 10 Especificaciones físicas

Tipo	Especificaciones	Comentarios
Peso	35 kg	
Dimensiones (anchura × profundidad × altura)	350 x 510 x 590 mm	
Voltaje de línea	100–240 V CA ± 10%	Capacidad de amplio rango
Frecuencia de línea	50 o 60 Hz ± 5%	
Consumo de corriente	350 VA / 300 W / 1024 BTU/h	Máximo
Temperatura ambiente operativa	5–40 °C	
Temperatura ambiente no operativa	De -40 a 70 °C	
Humedad	Por debajo del 80% a 31 °C	Sin condensación
Altitud operativa	Hasta 2000 m	
Refrigeración externa	máx. 0,5 bares, máx. 50 °C	Baño María
Presión externa	2-12 bares	Aire o nitrógeno sin aceite
Estándares de seguridad: IEC, CSA, UL	Categoría de instalación II, grado de contaminación 2.	Sólo para uso dentro de edificios
Carcasa	Todos los materiales son reciclables	

Para aplicaciones en modo CEC (cromatografía electrocapilar) o CE+p (electroforesis capilar con uso optativo de alta presión), puede emplearse una fuente externa de presión, a base de aire o nitrógeno sin aceite, a una presión máxima de 15 bares. A la entrega se suministra también el correspondiente adaptador macho que encaja con el hembra y los tubos de PTFE del instrumento.

NOTA

El sistema de electroforesis capilar Agilent 7100 está diseñado para funcionar en un entorno electromagnético normal, en cuya proximidad no deben usarse transmisores de RF como, por ejemplo, teléfonos móviles.

Especificaciones de rendimiento

Tabla 11 Especificaciones de rendimiento del sistema de electroforesis capilar Agilent 7100

Tipo	Especificaciones	Comentarios
Características de seguridad	Diagnósticos completos, detección y presentación de errores, detección de fugas, límite inferior de corriente. Sensor de fuga de líquidos, sensores de seguridad en la puerta y la tapa para desactivar el alto voltaje, sensor de viales.	
Control y evaluación de datos	Agilent ChemStation en Windows® XP (SP3)	
Comunicaciones	LAN, red de área de controlador (CAN), RS-232C, mando a distancia APG: señales de "ready", "start", "stop" y "shut-down". USB (uso futuro). Entrada y salida analógicas.	De 0 a 1 V
Características de GLP	Mantenimiento preventivo asistido (EMF), registros electrónicos de mantenimiento y errores	

設置について

7100 キャピラリ電気泳動装置が最適な性能で動作するためには、適切な環境に設置する必要があります。

設置作業を開始する前に、設置場所が以下の要件を満たしているかどうかを十分に確認してください。

電源について

本機器の電源は広範囲にわたる入力電圧に対応しており、46 ページ 図　表 12に記載された範囲の標準的な入力電圧で使用できます。したがって、装置背面に電圧スイッチはありません。

警告

電源コードが差し込まれている限り、電源を切っていても、モジュールは部分的に通電しています。

モジュールの修理作業時や保守作業時に人身障害に至る恐れがあります。たとえば、カバーが開いていてモジュールが電源に接続されている場合の感電などです。

- 電源コネクタに常にアクセスすることが可能か確認します。
- カバーを開ける前に、装置から電源ケーブルを取り外します。
- 装置背面の電子ボックスが開いているときやサイド・パネルが取り外されているときに、電源ケーブルを装置に接続しないでください。

警告

装置に対する不適正な入力電圧

仕様より高い入力電圧に接続すると、装置が衝撃を受けたり損傷したりすることがあります。

- 使用する装置は、指定された入力電圧に接続してください。

注意

電源コネクタに手が届かない

緊急時には、いつでも電源から装置を切り離せるようにする必要があります。

- 装置の電源コネクタに簡単に手が届き、抜くことができるかどうか確認します。
- ケーブルを抜くことができるように、装置電源ソケットの後ろには十分な空間を確保してください。

電源コード

本装置には各種の電源コードが付属しています。すべての電源コードのメス型側は同一の形です。電源コードのメス型側は、装置背面の電源ケーブルコネクタに差し込みます。電源コードのオス型側はコードによって異なり、各使用国または各地域のコンセントに合わせて設計されています。

警告

接地していない場合または指定外の電源コードの使用

接地していない場合や指定外の電源コードを使用した場合、感電や回路の短絡に至ることがあります。

- 接地していない電源を使用して本装置を動作させないでください。
- また、使用する地域に合わせて設計された電源コード以外は、決して使用しないでください。

警告

指定外ケーブルの使用

アジレントによって供給されたケーブル以外を使用すると、電子部品の損傷や人体に危害を及ぼすことがあります。

- 安全基準または EMC 規格への準拠を保証できるよう、アジレント製以外のケーブルは使用しないでください。

作業台スペース

本装置の寸法と重量は、ほぼすべての机や作業台に設置できるように設計されています。空気の循環と電源ケーブル接続のために、本装置の両側に 2.5 cm、背面に約 8 cm の空間が必要です。

作業台に Agilent 7100 装置を設置する場合、作業台が装置の重量に耐えるように設計されているか確認します。

本装置は必ず垂直に設置してください。

環境条件

本装置は、46 ページ 図　表 12 に記載されている周囲温度および相対湿度の仕様の範囲内で動作します。

注意

モジュール内の結露

結露によってシステムの電気回路が損傷することがあります。

- 温度変化によってモジュール内に結露が発生する可能性がある環境条件では、モジュールの保管、輸送、または使用を行わないでください。
- 寒冷な天候下でモジュールが出荷された場合は、結露が発生しないように、オートサンプラを梱包箱に入れたままゆっくり室温まで上げてください。

物理的仕様

表 12　物理的仕様

タイプ	仕様	説明
重量	35 kg	
寸法（幅 × 奥行き × 高さ）	350 x 510 x 590 mm	
入力電圧	100240 VAC ± 10%	広範囲の電圧に対応
電源周波数	50 または 60 Hz ± 5 %	
消費電力	350 VA / 300 W / 1024 BTU/ 時	最大
動作周囲温度	540 ℃	
保管周囲温度	-40 ～ 70 ℃	
湿度	31 ℃で 80 % 以下	結露なし
使用高度	最大 2,000 m	
外部冷却	最大 0.5 bar、最高 50 ℃	水槽
外部圧力	2-12 bar	オイルフリーの空気または窒素
安全規格： IEC、CSA、UL	設置クラス II、汚染度 2	室内使用専用
ハウジング	全材料リサイクル可	

CEC（キャピラリ電気クロマトグラフィ）モードまたは CE+p（キャピラリ電気泳動、高圧使用オプション適用）モードでアプリケーションを使用する場合、最大 15 bar のオイルフリーの空気または窒素を外部装置から供給できます。本装置のメス型アダプタおよびPTFE チューブに合わせたオス型アダプタが付属しています。

注記

Agilent 7100 電気泳動システムは、標準的な電磁環境で動作するように設計されているため、近くで携帯電話などの無線送信機を使用しないでください。

性能仕様

表 13 Agilent 7100 システムの性能仕様

タイプ	仕様	説明
安全性機能	豊富な診断機能、エラーの検出と表示、漏電検出、電流の下限値 漏水センサ、高電圧を無効化する安全センサ（扉およびカバーに搭載）、バイアル・センサ	
コントロールおよびデータの評価	Agilent ChemStation（Windows® XP SP3 対応）	
通信	LAN、コントローラ・エリア・ネットワーク（CAN）、RS-232C、APG リモート： Ready、Start、Stop、Shut-down の各シグナル。 USB（将来使用）。 アナログ出力およびアナログ入力。	0 ～ 1 V
GLP 機能	アーリーメンテナンス・フィードバック（EMF）機能、メンテナンスとエラーの電子記録	

场地要求

为了确保达到 7100 毛细管电泳仪的最佳性能，务必选择适合的环境。

开始安装之前，请仔细检查所选场地是否满足下列要求。

电源要求

仪器电源适合较宽的电压范围，可承受第 51 页的表 14 中所列范围内的任何标准线路电压。因此，检测器的背面没有电压选择器。

警告

只要未拔掉电源线，即使在关闭部件后，部件仍会部分带电。

在部件盖打开且部件处于通电状态时，维修或维护部件可能会造成人身伤害（如电击危险）。

- 请确保始终可以拔插电源插头。
- 在打开部件盖之前，请拔掉仪器的电源电缆。
- 当仪器背面的电子盒打开或侧板被拆下时，请勿连接仪器的电源电缆。

警告

连接至仪器的线路电压不正确

如果设备连接到的线路电压超过了规定电压，则会造成电击危险或仪器损坏。

- 请将仪器连接至规定的线路电压。

小心

电源插头不可插拔。

遇到紧急情况时，必须能够随时断开仪器与电源线的连接。

- 请确保仪器的电源插头易于插入和拔出。
- 仪器电源插座后面要有足够空间，以便拔出电缆。

电源线

仪器随附有多种电源线。所有电源线的母接头均相同。母接头插入到后部的电源插座中。每根电源线的公接头均不同，是为了与特定国家或地区的墙上插座相匹配而专门设计的。

警告

没有接地连接或没有使用规定的电源线

没有接地连接和没有使用规定的电源线可能导致电击或短路。

- 切勿将仪器连接到没有接地连接的电源插座中。
- 除安捷伦科技为使用地区设计的电源线外，切勿使用其他电源线。

警告

使用非随附的电缆

使用非安捷伦科技提供的电缆会导致电子元件受损或人员受伤。

- 为确保功能正常并符合安全规定或 EMC 规定，切勿使用不是由安捷伦科技提供的电缆。

工作台位置

就仪器的尺寸和重量而言，仪器几乎可置于任何桌子或实验室工作台上。为了便于空气流通和电路连接，需要在仪器左右两侧各留出 2.5 cm 的空间，并在背面留出大约 8 cm 的空间。

如果要将 Agilent 7100 仪器放置在工作台上，请确保此工作台能够承受该系统的重量。

仪器必须竖直放置。

环境

仪器的工作环境应符合第 51 页的表 14 中所规定的环境温度和相对湿度要求。

小心

部件内的冷凝

如发生冷凝，将导致系统电子元件受损。

- 温度波动可能会导致部件内发生冷凝，请不要在这种条件下贮存、运输或使用部件。
- 如果在寒冷天气条件下运输部件，不要马上开箱，应等到部件在运输箱内缓慢升至室温后再开箱，以此避免发生冷凝。

物理规格

表 14 物理规格

类型	规格	注释
重量	35 kg	
尺寸 （宽 × 长 × 高）	350 x 510 x 590 mm	
线路电压	100–240 VAC ± 10%	较宽的适用范围
线路频率	50 Hz 或 60 Hz ± 5%	
耗电量	350 VA / 300 W / 1024 BTU/h	最大
操作环境 温度	5–40 °C	
非操作环境 温度	-40 °C 至 70 °C （-40 °F 至 158 °F）	
湿度	31 °C 时低于 80%	不冷凝
操作海拔高度	最高 2000 m	
外部冷却	最大 0.5 bar，最高 50 °C	水浴
外部压力	2-12 bar	无油空气或氮气
安全标准：IEC、CSA、 UL	安装类别 II，污染程度 2。	仅限于室内使用
外壳	所有材料均可回收利用	

对于在 CEC 模式 （毛细管电色谱法）或 CE+p 模式 （毛细管电泳模式且可选用较高压力）下的应用，则可以使用可提供最大压力 15 bar 的无油空气或氮气的外部压力设备。随附适合于仪器母接头的相应公接头以及 PTFE 管。

注意

Agilent 7100 毛细管电泳系统可以在典型电磁环境下使用，在这种环境下不应近距离使用射频发射器，例如移动电话。

性能规格

表 15 Agilent 7100 系统的性能规格

类型	规格	注释
安全功能	全面诊断、故障检测和显示、漏电检测；电流下限 液体泄漏传感器；安全传感器（位于门和盖上，用于禁用高电压）；样品瓶传感器；	
控制和数据评估	在 Windows XP (SP3) 下运行的 Agilent ChemStation	
通讯	LAN，控制器局域网 (CAN)， RS-232C， APG 遥控：就绪、启动、停止和关机信号。 USB（将来使用）。 模拟输出和输入。	0 V 至 1 V
GLP 功能	维护信息预报 (EMF)，维护和故障的电子记录	

3
Installing the Instrument

Unpacking the Agilent CE Instrument 54
Installing the Instrument 57

In this chapter you will find information on

- how to unpack the Agilent CE instrument
- how to set up the Agilent CE instrument

Information on how to install the Agilent ChemStation software or on how to install the Lab Advisor/Instrument Utilities software can be found in separate documentation located on the respective software DVD.

Unpacking the Agilent CE Instrument

Damaged Packaging

If the delivery packaging shows signs of external damage, please call your Agilent Technologies sales and service office immediately. Inform your service representative that the instrument may have been damaged during shipment.

CAUTION

"Defective on arrival" problems

If there are signs of damage, please do not attempt to install the module. Inspection by Agilent is required to evaluate if the instrument is in good condition or damaged.

- Notify your Agilent sales and service office about the damage.
- An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.

Unpacking the CE Instrument

The Agilent CE instrument is heavy and should be carried by two people.

1. Use the recessed handles on both sides to carry the Agilent CE instrument.
2. Open the box in which the Agilent CE instrument was shipped.
3. Pull the Agilent CE instrument out of the box and position it in a suitable location.

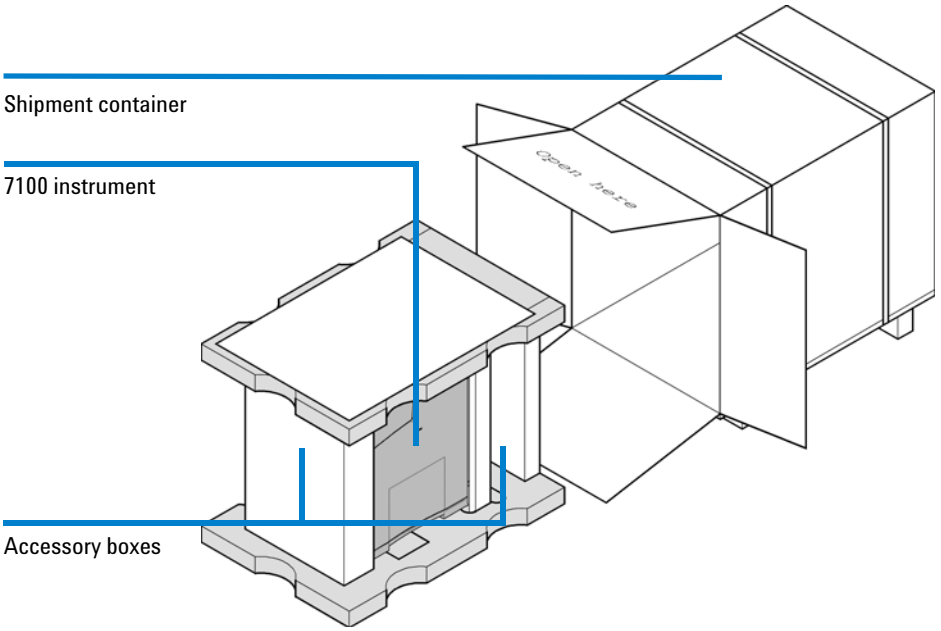

Figure 1 Unpacking the Agilent CE instrument

Delivery Checklist

Ensure all parts and materials have been delivered with the instrument. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Accessories

The accessories shipped with the Agilent CE instrument are in additional boxes on right and left in the instrument box. Check that you have received everything using Table 16.

Table 16 Accessories

Description	Part number	Quantity
HPCE startup capillary kit	**G7100-68700**	1
Detector interface, green, 50 µm	**G7100-60210**	1
Detector interface, red, 50 µm, BF3	**G7100-60230**	1
Accessory kit	**G7100-68705**	1
– Coupler	**0100-1633**	2
– O-ring 25.12-mm-id 1.78-mm-XSECT-DIA	**0905-1163**	1
– Container	**1540-0307**	1
– Fuse T6.3AH, 250 VAC	**2110-1018**	2
– Fuse T6.3AL, 250 VAC	**2110-0623**	2
– Fuse T3.15AL, 250 VAC	**2110-1417**	4
– Air filter	**3150-0619**	1
– Tubing assembly	**5063-6527**	1
– Screwdriver, slot shaft	**8710-2607**	1
– Screwdriver, Pozidriv shaft	**8710-0899**	1
– 12 mm socket wrench	**8710-2076**	1
Lift tubing assy	**G1600-67003**	1
Vial crimp/snap polypropylene 1 mL 100/PK	**5182-0567**	1
Snap caps, polyurethane 100/PK	**5181-1512**	1
Cable, remote	**5061-3378**	1
CE catalog	**5988-6616EN**	1
LAN cable (crossover)	**5023-0203**	1
Bottle, 500 mL, electrolyte	**9300-1748**	2
HPCE-Primer	**G7100-90001**	1
CE System User's Guide	**G7100-90000**	1
Glass filter, solvent inlet	**5041-2168**	1
Electrode alignment assy	**G7100-60107**	1

Installing the Instrument

Physical Connection

WARNING

Module is partially energized when switched off, as long as the power cord is plugged in.

Repair or maintenance work on the module can lead to personal injuries, for example a shock hazard, when the cover is opened and the module is connected to the power.

- Ensure that line power cord is disconnected before setting up your Agilent CE instrument.

In general you have to go through the following steps.

1. Unpack the Agilent CE instrument and position it in a suitable location on your bench, see "Unpacking the Agilent CE Instrument" on page 54.
2. Connect the cables at the rear of the Agilent CE instrument.
3. Install the bottles in the replenishment system, see "Preparing the Replenishment System if Needed" on page 111.

Connecting Cables

The Agilent CE instrument has the following connectors on the rear.

- All electrical connectors, such as line power, LAN connector or fuses, are located on the right-hand side of the electronic box on the back of the instrument.
- All connectors for liquids and external pressure supply are located on the left-hand side of the electronic box.

1 Ensure that the line power switch on the front of the instrument is OFF.

2 Connect the following cables as shown in Table 2 and in Figure 2.

   a One power cable

   b LAN cable, which connects the Agilent CE instrument directly to the computer with the Agilent ChemStation installed or to the local network.

For a description of remaining items refer to the Hardware section.

- For more information on cable connection to 3rd party detectors or analog out, please refer to “Hardware Information” on page 171.

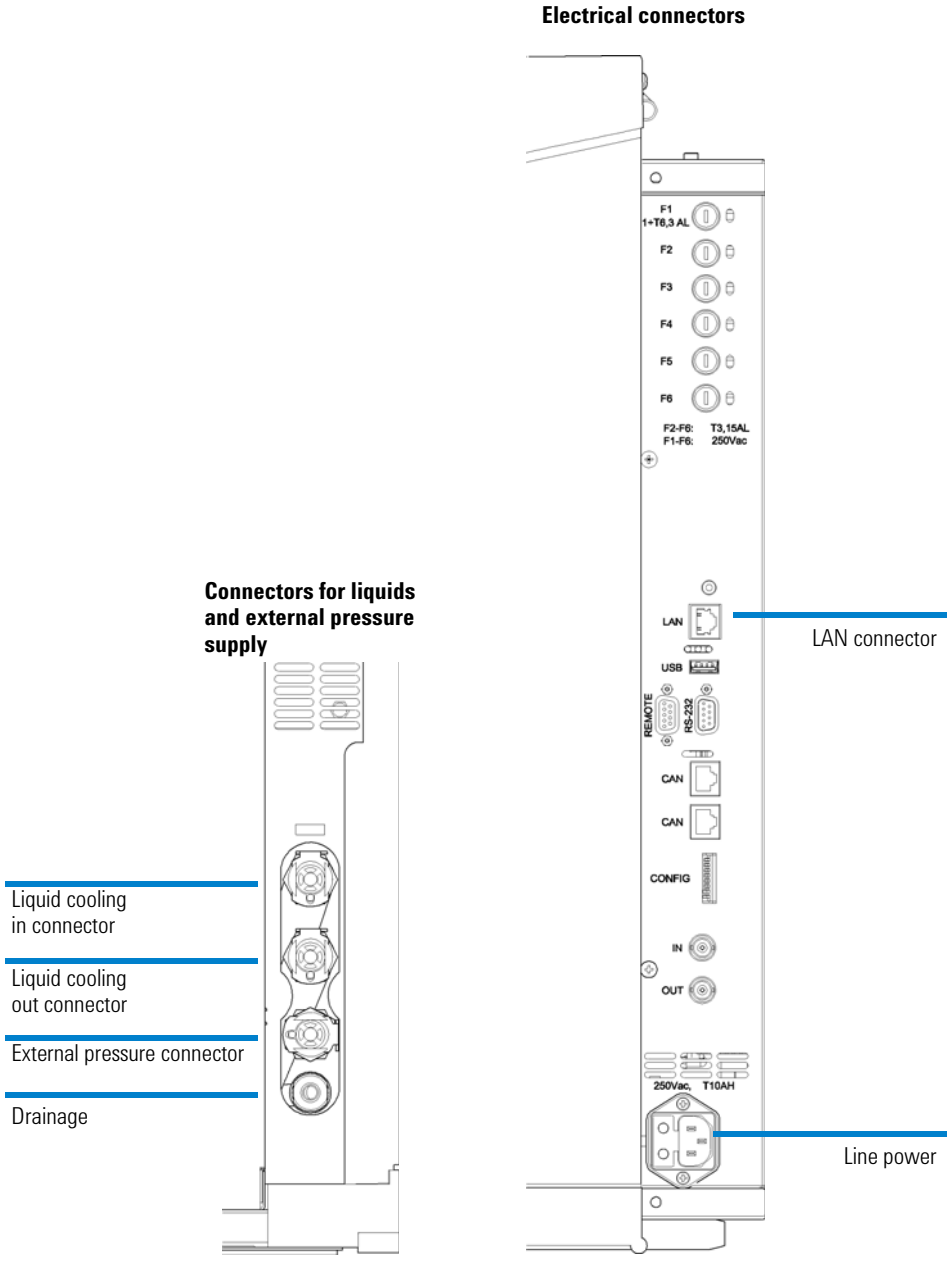

Figure 2 Connections on the rear of the instrument

4
LAN Configuration

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Location of the Media Access Control (MAC) Address 76

This chapter provides information on connecting the CE instrument to the Agilent ChemStation PC.

What You Have to Do First

The instrument has an on-board LAN communication interface. Please review the following options:

1. The instrument will be connected to the LAN: Ask your administrator to provide you with an IP address, a subnet mask address and a gateway address. Proceed with manual configuration (see “Manual Configuration” on page 71). You will have to initially establish a LAN connection using the default settings of the instrument and a crossover LAN cable (see Table 19 on page 68).
2. The instrument and PC will be set up locally via a crossover cable or a hub: No addresses are needed. Proceed with establishing a LAN connection using the default settings of the instrument (see Table 19 on page 68).
3. Identification of the instrument in your LAN by MAC address: If you plan to let a Bootp service (see “Agilent Bootp Service” on page 75) assign an IP address please continue with locating the Media Access (MAC) address and proceed with the respective initialization modes in “Initialization Mode Selection” on page 65 and the installation instruction in the "Installing your ChemStation for LC and CE" manual. Ask your administrator to provide you with an IP address, a subnet mask address and a gateway address.

In addition to LAN communication, the instrument allows serial communication access via the RS 232 cable to the COM port of the PC. However, the data transfer rate would be too low for running the instrument at full performance. This alternative data connection is only meaningful if the Lab Advisor software is for example used for troubleshooting reasons (see “Agilent Lab Advisor Software” on page 169).

Please see “Starting Your Computer and the Agilent ChemStation Software” on page 81 for information on configuration of the connection settings of the ChemStation software.

TCP/IP Parameter Configuration

To operate properly in a network environment, the LAN interface must be configured with valid TCP/IP network parameters. These parameters are:

- IP address
- Subnet mask
- Default gateway

The TCP/IP parameters can be configured by the following methods:

- by automatically requesting the parameters from a network-based BOOTP service (using the so-called bootstrap protocol), see "Agilent Bootp Service" on page 75
- by manually setting the parameters using Telnet

The LAN interface differentiates between several initialization modes. The initialization mode (abbreviation: 'init mode') defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived from a Bootp cycle, non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch, see Table 17 on page 64.

Configuration Switch

The configuration switch can be accessed on the right rear side of the instrument. The 7100 CE is shipped with switches 7 and 8 set to ON. This means that the instrument is set to a fixed default IP: 192.168.254.11

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF.

Table 17 Factory default settings

Initialization ('init') mode	Using default, switches 7 and 8 set to ON.
Link configuration	Speed and duplex mode determined by auto-negotiation

Initialization Mode Selection

The following initialization (init) modes are selectable:

Table 18 Initialization mode switches

	SW6	SW7	SW8	Init mode
	OFF	OFF	OFF	Bootp
	OFF	OFF	ON	Bootp & Store
	OFF	ON	OFF	Using Stored
	OFF	ON	ON	Using Default

Bootp

When the initialization mode "Bootp" is selected, the 7100 CE tries to download the parameters from a Bootp server. The parameters obtained become the active parameters immediately. They are not stored in the non-volatile memory of the 7100 CE. Therefore, the parameters are lost with the next power cycle of the 7100 CE.

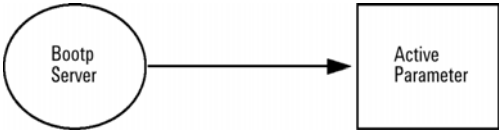


Figure 3 Bootp (principle)

Bootp & Store

When "Bootp & Store" is selected, the parameters obtained from a Bootp server become the active parameters immediately. In addition, they are stored in the non-volatile memory of the 7100 CE. Thus, after a power cycle they are still available. This enables a kind of "Bootp once" configuration of the 7100 CE.

Example: The user may not want to have a Bootp server be active in his network all the time. But on the other hand, he may not have any other configuration method than Bootp. In this case he starts the Bootp server temporarily, powers on the 7100 CE using the initialization mode "Bootp & Store", waits for the Bootp cycle to be completed, closes the Bootp server and powers down the 7100 CE. Then, he selects the initialization mode "Using Stored" and powers on the 7100 CE again. From now on, he is able to establish the TCP/IP connection to the 7100 CE with the parameters obtained in that single Bootp cycle.

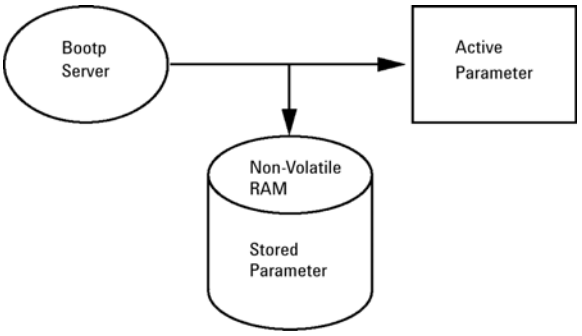


Figure 4 Bootp & Store (principle)

NOTE

Use the initialization mode "Bootp & Store" carefully, because writing to the non-volatile memory takes time. Therefore, if the 7100 CE is to obtain its parameters from a Bootp server every time it is powered on, the recommended initialization mode is "Bootp"!

Using Stored

When initialization mode "Using Stored" is selected, the parameters are taken from the non-volatile memory of the instrument. The TCP/IP connection will be established using these parameters. The parameters were configured previously by one of the described methods.

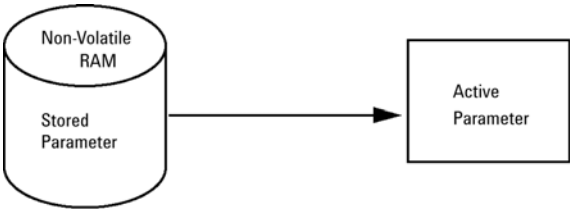


Figure 5 Using Stored (principle)

Using Default

When “Using Default” is selected, the factory default parameters are used instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration, see Table 19 on page 68.

A direct connection of a computer and the 7100 instrument is the entry point to change the stored parameters of the instrument. The default parameters of the 7100 instrument are permanently stored and cannot be changed. Using them, this allows you to establish a LAN connection at any time when the init mode “Using Default” is configured.

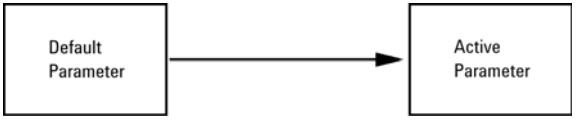


Figure 6 Using Default (principle)

NOTE Using the default address in your local area network may result in network problems. Take care and change it to a valid address immediately unless you plan a direct LAN connection to stand-alone PC.

Table 19 Using Default parameters

IP address:	192.168.254.11
Subnet mask:	255.255.255.0
Default gateway	Not specified

Since the default IP address is a so-called local address, it will not be routed by any network device. Thus, the PC and the CE instrument must be in the same subnet.

The user may open a Telnet session using the default IP address and change the parameters stored in the non-volatile memory of the CE instrument. He may then close the session, select the initialization mode "Using Stored", power-on again and establish the TCP/IP connection using the new parameters.

When the 7100 CE instrument is wired to the PC directly (for example using a cross-over cable or a local hub), that is separate from the local area network, the user may simply keep the default parameters to establish the TCP/IP connection.

NOTE

In the "Using Default" mode, the parameters stored in the memory of the 7100 Capillary Electrophoresis instrument are not cleared automatically. If not changed by the user, they are still available when you switch back to the mode "Using Stored".

Link Configuration Selection

The LAN interface supports 10 or 100 Mbps operation in full or half-duplex modes. In most cases, full-duplex is supported when the connecting network device - such as a network switch or hub - supports IEEE 802.3u auto-negotiation specifications.

When connecting to network devices that do not support auto-negotiation, the LAN interface will configure itself for 10 or 100-Mbps half-duplex operation.

For example, when connected to a non-negotiating 10-Mbps hub, the LAN interface will be automatically set to operate at 10-Mbps half-duplex.

If the CE instrument is not able to connect to the network through auto-negotiation, you can manually set the link operating mode using link configuration switches on the CE instrument.

Table 20 Link configuration switches

	SW3	SW4	SW5	Link configuration
	OFF	-	-	Speed and duplex mode determined by auto-negotiation
	ON	OFF	OFF	Manually set to 10 Mbps, half-duplex
	ON	OFF	ON	Manually set to 10 Mbps, full-duplex
	ON	ON	OFF	Manually set to 100 Mbps, half-duplex
	ON	ON	ON	Manually set to 100 Mbps, full-duplex

Storing the Settings Permanently with Bootp

If you want to change parameters of the CE instrument using Bootp follow the instructions below.

1. Turn off the CE instrument.
2. Change the CE instrument's settings for the configuration switch to "*Bootp & Store*" mode, see Table 18 on page 65.
3. Start the Agilent Bootp Service (see "Agilent Bootp Service" on page 75) and open its window.
4. If required, modify the parameters for the CE instrument according to your needs using the existing configuration.
5. Press OK to exit the Bootp manager.
6. Now turn on the CE instrument and view the Bootp server window. After some time the Agilent Bootp Service will display the request from the LAN interface. The parameters are now stored permanently in the non-volatile memory of the CE instrument.
7. Close the Agilent Bootp Service and turn off the CE instrument.
8. Change the settings of the CE instrument's configuration switch to "*Using Stored*" mode, see Table 18 on page 65.
9. Power cycle the CE instrument. The CE instrument can be accessed now via LAN without the Agilent Bootp Service, refer to "Agilent Bootp Service" on page 75.

Manual Configuration

Manual configuration only alters the set of parameters stored in the non-volatile memory of the CE instrument. It never affects the currently active parameters. Therefore, manual configuration can be done at any time. A power cycle is mandatory to make the stored parameters become the active parameters, if the initialization mode selection switches permit this.

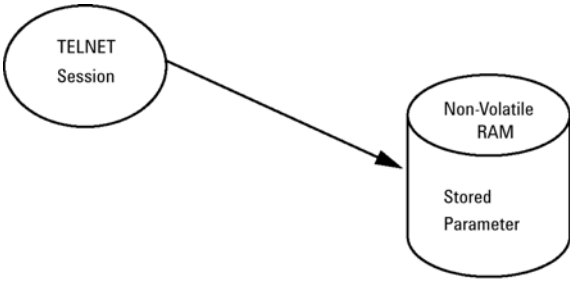


Figure 7 Manual configuration (principle)

With Telnet

Whenever a TCP/IP connection to the 7100 CE instrument is possible (TCP/IP parameters set by any method), the parameters may be altered by opening a Telnet session. Please refer to “Using Default” on page 67 for establishing an initial LAN connection.

1 Open the system (DOS) prompt window by clicking the Windows **START** button and select "**Run...**". Type "cmd" and press OK.

2 Type the following after the system (DOS) prompt:

-

```
c:\>telnet <IP address>
```

or

-

```
c:\>telnet <host name>
```

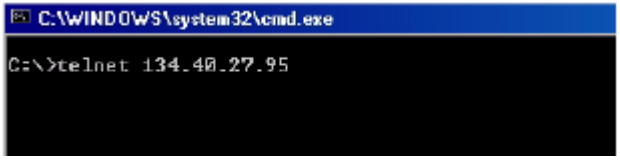


Figure 8 Telnet - starting a session

where <IP address> may contain the assigned address from a Bootp cycle, or the default IP address (see “Configuration Switch” on page 64).

If the connection is established successfully, the instrument responds with the following:

Figure 9 A connection to the instrument has been made

3 Type

?

and press **[Enter]** to see the available commands.

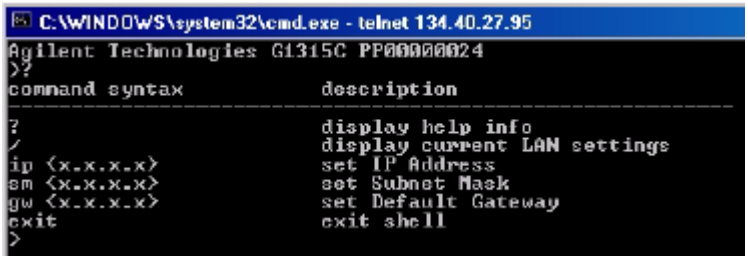


Figure 10 Telnet commands

Table 21 Telnet commands

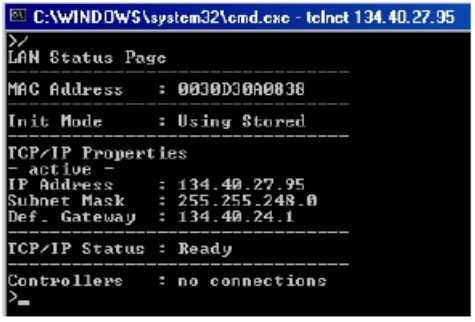
Value	Description
?	Displays syntax and descriptions of commands
/	Displays current LAN settings
ip <x.x.x.x>	Sets new IP address
sm <x.x.x.x>	Sets new subnet mask
gw <x.x.x.x>	Sets new default gateway
exit	Exits shell and saves all changes

4 To change a parameter follows the style:

- parameter value, for example:
  `ip 134.40.27.230`

Then press **[Enter]**; parameter refers to the configuration parameter you are defining, and value refers to the definitions you are assigning to that parameter. Each parameter entry is followed by a carriage return.

5 Use “/” and press **[Enter]** to list the current settings.



Information about the LAN interface

MAC address, initialization mode

Initialization mode is Using Stored

active TCP/IP settings

TCP/IP status - here ready

connected to a PC with controller software (for example Agilent ChemStation), here not connected

Figure 11 Telnet - current settings in "Using Stored" mode

6 Change the IP address (in this example 134.40.27.99) and type “/” to list the current settings.

NOTE If the initialization mode switch is changed now to “Using Stored” mode, the instrument will take over the stored settings when the instrument is re-booted. In the example above, it would be 134.40.27.99.

Agilent Bootp Service

Agilent Bootp Service provides central administration of IP addresses for Agilent CE instruments in a LAN. The service runs on the instrument LAN PC, which must be running a TCP/IP network protocol and cannot run a DHCP server.

When an instrument is powered on, a LAN interface in the instrument sends a request for an IP address or host name and provides its hardware address as an identifier. The request may continue for up to 5 minutes. The Agilent Bootp Service answers this request and passes a previously defined IP address and host name associated with the hardware address to the requesting instrument.

When the instrument receives its IP address and host name, it stops sending the request. It maintains the IP address as long as it is powered on. Powering down the instrument causes it to lose its IP address, so the Agilent Bootp Service must be started. Since the Agilent Bootp Service runs in the background, the instrument will receive its IP address once it is powered up.

Detailed documentation on installation and the usage of the Agilent Bootp Service can be found on your ChemStation installation DVD under **\Support\Manuals\Installation**.

Location of the Media Access Control (MAC) Address

The MAC or hardware address of the LAN interfaces is a world-wide, unique identifier. No other network device will have the same hardware address. The MAC address is physically located on the electronic main board in the rear box of the instrument. It is not accessible by the user.

The MAC can be reviewed from a connected instrument by accessing it via a Telnet session as described earlier. Please follow the instructions on Manual Configuration, Using Telnet ("With Telnet" on page 72) and see Figure 11 on page 74 for the location of the MAC address as the second line in the LAN status page.

5
Using the Agilent 7100 Capillary Electrophoresis System

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Capillary Electrochromatography, CEC 148

This chapter provides information on how to set up the CE instrument for an analysis and explains the basic settings.

System Definition

After your Agilent 7100 Capillary Electrophoresis System has been properly installed (see “Installing the Instrument” on page 53) you can begin exploring the system. Your Agilent 7100 Capillary Electrophoresis System comprises the CE instrument, the ChemStation and the Lab Advisor/Instrument Utilities software. The CE instrument doesn't have a keyboard itself. It is completely controlled by the ChemStation through the CE and DAD diagram.

For detailed description of data evaluation see the manuals “Understanding Your ChemStation" and “Agilent ChemStation for CE System, Installing and Understanding"

Controlling the Agilent CE Instrument

Before You Start the Agilent CE Instrument

Use the following as a checklist before you start the Agilent CE instrument.

Make sure that:

- the replenishment bottles are installed and properly tightened,
- the cassette (with a capillary installed) is inserted in the system,
- the cassette door and the tray door are closed, and
- you do not need to put the vials into the tray before you start the Agilent CE instrument

Starting Up the Agilent CE Instrument

The power switch of the instrument is located on the left front corner of the instrument.

Press this switch to turn on the line power.

After the instrument is started, the fans and the pump start working. The instrument starts to build-up internal pressure (approximately 950 mbar) first, followed by a vacuum. The pump becomes idle and switches on only occasionally once the pressure and vacuum setpoints are reached.

During initialization the instrument tests different functions and adjustments. The tray as well as all three lift stations are moved.

The UV lamp will switch on during instrument startup based on parameters that can be defined in the DAD control section, see “Diode Array Detector” on page 179. Otherwise, the lamp can be switched on from the DAD diagram of the ChemStation.

The meaning of the LED colors on the front cover are explained in the following table.

Table 22 Status LED color

Color	Meaning
No color	Instrument is ready
Green	Analysis running, do not use instrument with the exception of manual operation of the tray. Some fields in DAD and CE diagram are shaded gray.
Yellow	Not-ready condition. The run cannot be started yet. When you start, the LED will come on after a certain time. Click the Agilent CE System status bar in the ChemStation to see what is not ready (for example temperature).
Red	Error condition. There was or is currently a problem with the instrument or communication to the PC, which requires your action or an acknowledgement. To get more information, connect to the instrument with the Lab Advisor or ChemStation software. Check the logbook.

NOTE

A blinking red LED indicates the instrument is in a resident mode. This means only a core of the firmware is active and the instrument has limited functionality. The Lab Advisor software will be able to connect to the instrument under these circumstances. An instrument restart by switching the power off and on again boots with complete firmware loaded. During a main firmware download (see "Firmware" on page 176), the instrument shows a red blinking LED.

Starting Your Computer and the Agilent ChemStation Software

After you have switched on your computer and it has booted up, start the Agilent ChemStation by double clicking the **Instrument Online** icon in the Agilent ChemStation menu.

NOTE In order to control the 7100 Capillary Electrophoresis instrument, the ChemStation revision must be B.04.02 or higher.

NOTE We recommend you install the Lab Advisor software revision B.01.03 or higher.

If you have problems starting the Agilent ChemStation, check that the software has been properly installed. During startup the ChemStation might ask you to update the connection settings, see Figure 12. You might suppress this message in the future. If you want to update the instrument configuration, select **Yes**. Typically, an instrument configuration must be updated for first time use of the software, changes in the IP address or changes in the mode of usage.

NOTE Please refer to the ChemStation documentation and online help for details on installation and configuration of the 7100 CE instrument.

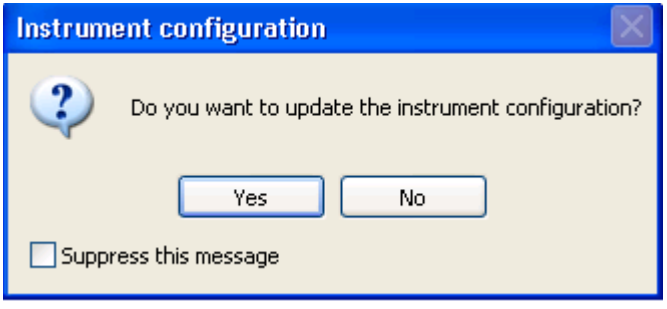


Figure 12 Instrument configuration during ChemStation startup

Starting the Agilent ChemStation Software the First Time

Starting the Agilent ChemStation software the first time will lead to the following message:

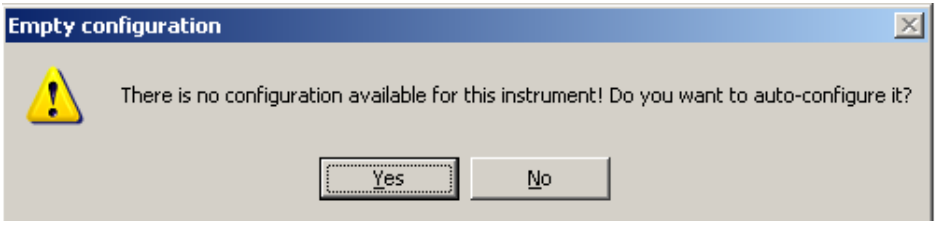


Figure 13 Configuration at first start of ChemStation

Please select **Yes**. The following dialog will allow you to configure the instrument. Please provide an IP address or host name in the subsequent dialog. Check the respective radio button and type in either the IP address or the host name of your instrument.

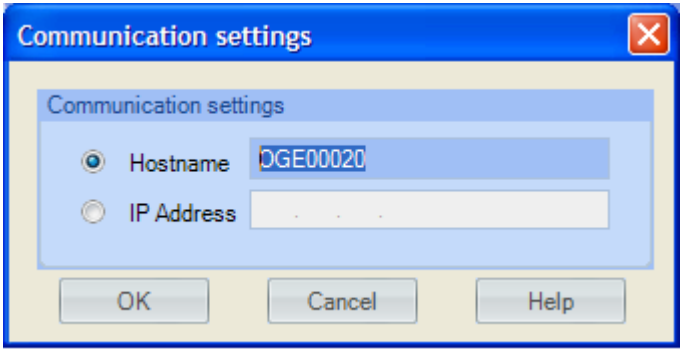


Figure 14 Request of IP address or host name

The auto-configuration process will detect an instrument at the IP address or host name you provide. You can confirm the instruments identity with the serial number.

Please select "Configure..." if you would like to connect to a different instrument.

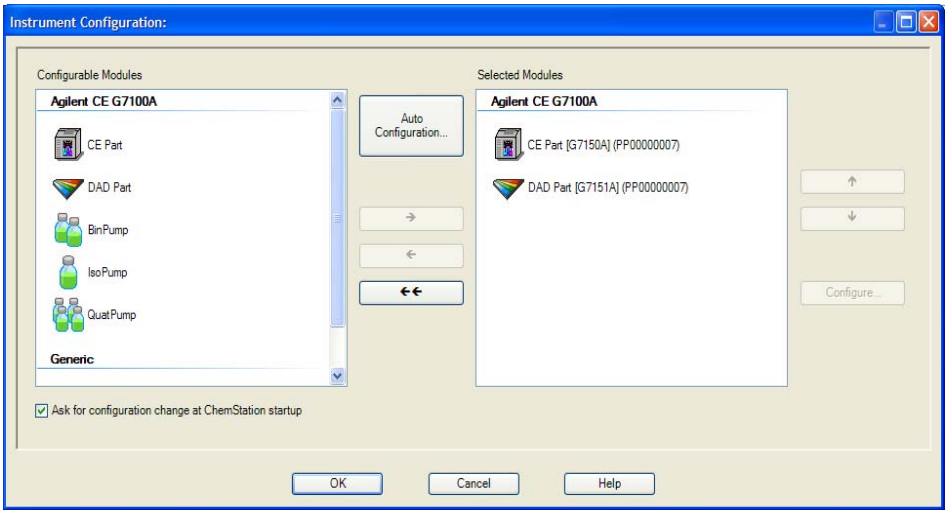


Figure 15 Configuration menu

NOTE

Please refer to "LAN Configuration" on page 61 for the default IP address or manual configuration of an individual IP address.

After you have double clicked the **Instrument Online** icon, the software is loaded with the last method used. The software boots in the exact last status.

Do not use the instrument or the graphical user interface during initialization. Wait until the system has reached the ready state.

If there is a vial in tray position 50 (reserved position), the system asks you to remove that vial before you proceed.

Duplicate vials are put in the tray and the respective position is brought to the front. Duplicate vials may occur if vials from the tray are loaded in a lifter and later on another vial is loaded in the same tray position.

If there are no bottles (electrolyte or waste) in the replenishment system or they are not properly tightened, the error LED (red) will come on because no pressure can be built up. Check the logbook for more information.

Working with the CE Diagram

When you start the Agilent ChemStation, the CE and DAD diagram appears by default as the main screen. The CE diagram displays the Agilent CE instrument showing the current status of the system as a whole. Each icon represents one component in the system.

Common Software Toolbar

The software tool bars in the Agilent ChemStation offer a group of commonly used functions. The software tools bars visible in the Method and Run Control View are shown in Figure 17 on page 86. To change values for a component, you must choose the appropriate icon.

This will bring up the menu. The menu may comprise sets of items; for changing parameters in your method, for control of the instrument, and for help.

The tool bars associated with the Data Analysis View and Report Layout view look similar and are described in the online help and the ChemStation documentation.

For more assistance, click **Help** in the menu bar.

Software Toolbar

Figure 16 Components of the common software toolbar of the ChemStation.

1 Work with sequences

2 Work with single vial analysis

3 Load method

4 Store method

5 Store sequence

6 Load sequence

7 Change the layout to show the sampling area and diagram

8 Change the layout to show two online plots

9 Change the layout to show two online plots and the current log book

10 Display the current logbook

11 Display the current sequence logbook

12 Open the Preferences dialog

13 Name of current sequence

14 Name of current method

15 Display of elapsed and overall run time

16 Status display

17 Display sample information for sequences or single vials

18 Access integration, calibration and reporting settings

19 Access sequence templates

20 Access methods

Graphical User Interface Explanation

Components of the Agilent CE instrument in the CE diagram (synonym dashboard) are shown in Figure 17. Each component in the instrument is represented by an icon in the CE diagram or DAD diagram.

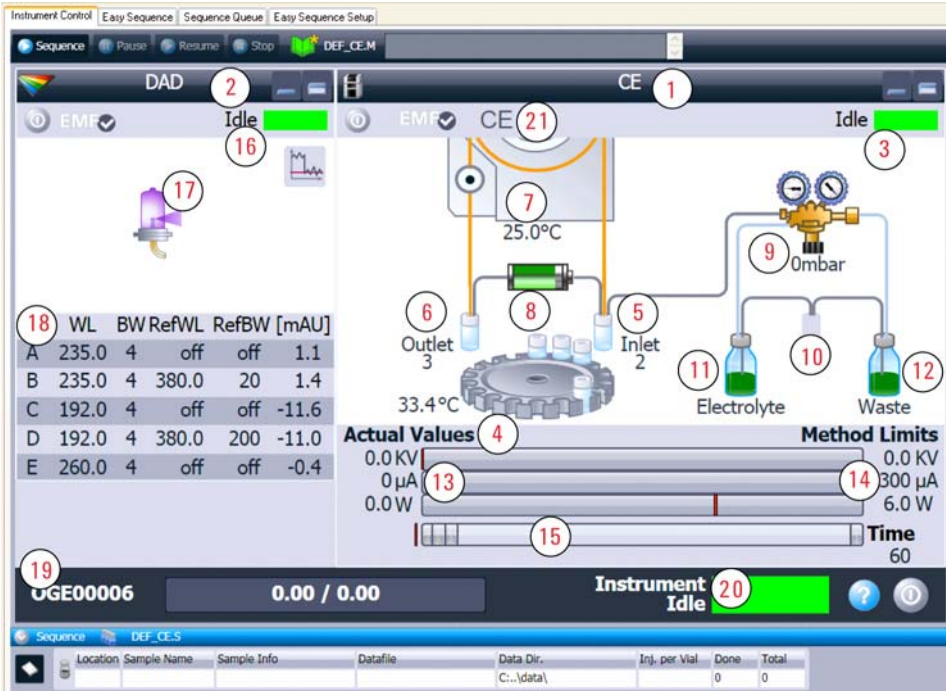


Figure 17 The CE and DAD diagram represents each component in the instrument

1 CE control diagram
2 DAD control diagram
3 CE status
4 Tray / tray temperature
5 Inlet lift / loaded vial
6 Outlet lift / loaded vial
7 Cassette temperature
8 High voltage power supply
9 Internal pressure
10 Replenishment station
11 Electrolyte bottle / pressure storage
12 Waste bottle / vacuum storage
13 Current electrical values
14 Electrical parameter from method
15 Method steps and progress
16 DAD status
17 Lamp
18 Detector wavelengths/spectra
19 Instrument identifier
20 Overall instrument status
21 Instrument mode

The current analysis mode is displayed in the top line of the CE diagram. The analysis modes that can be selected under instrument configuration are CE, CE+p, CEC or CE-MS.

For configuration without a DAD detector, for example with external detectors, the DAD diagram will not be displayed. For configuration with an additional pump, for example CE-MS, an additional pump diagram will be displayed.

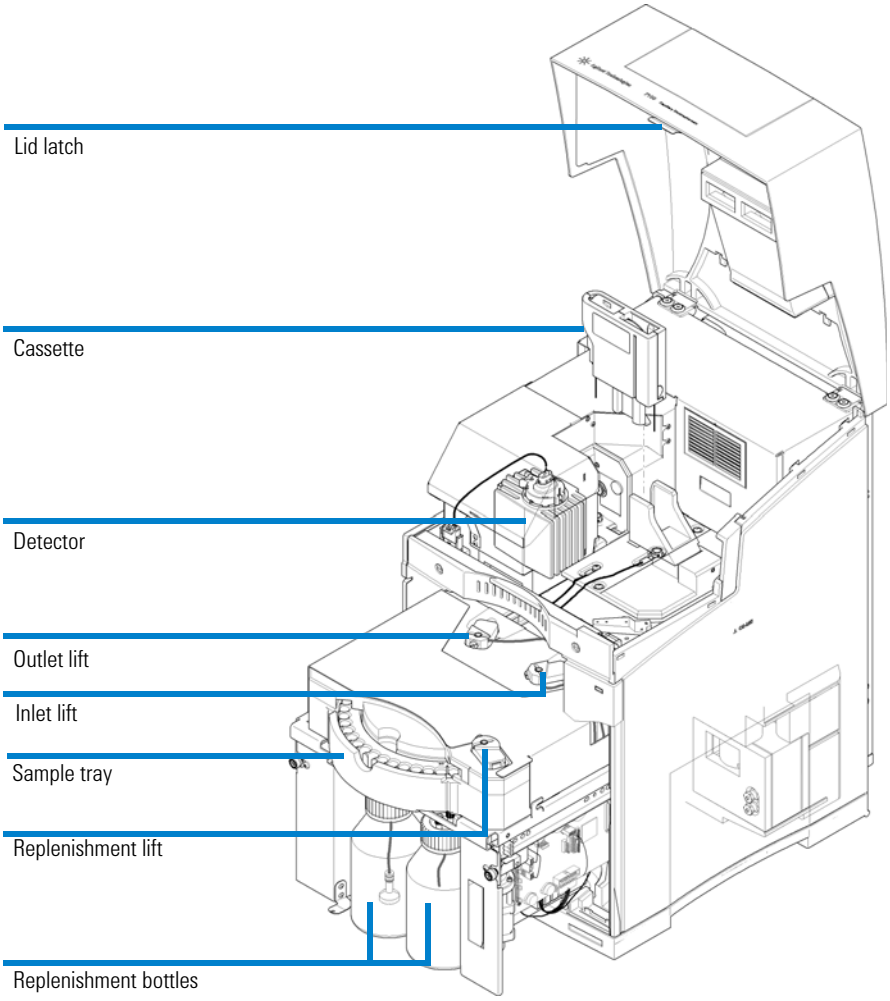


Figure 18 Corresponding hardware components

Menus in the CE and DAD Diagram

The CE and DAD diagram offers access to directly control several instrument components, as well as access to method parameters. Right-clicking in the background of each diagram provides access to the context menus (Figure 19).

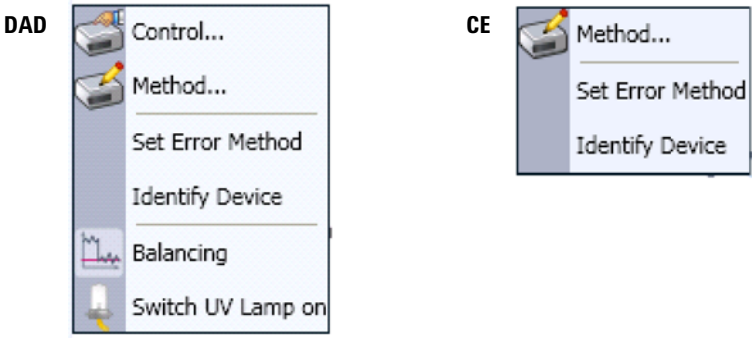


Figure 19 Menus in the DAD and CE diagram

To trigger actions for an instrument component, select the appropriate icon in the diagram. A context menu including possible actions, such as switching on the lamp, appears. Any instrument action triggered through such a menu does not change the current method.

To change values for a component, select the appropriate icon. A menu with three general items and parameter specific for the component appears.

Method

A click here requests the current method from the instrument and opens the CE **Method Setup** dialog box for the CE part of the current method or the respective DAD part. To set up a complete method, refer to "How to Use Your Agilent CE Instrument for Capillary Electrophoresis Separations" on page 92. If closed with **OK** the (possibly) modified method is downloaded to the device. If changes have been made an asterisk is added to the method status. The method status is represented by a book icon in the top line of the dashboard.

Direct Control of Instrument Components

The actions are performed immediately and the changes are reflected in the CE diagram. Such actions include, for example:

- Switching the lamp on.
- Controlling the sample tray.
- Lowering the lift stations to remove the capillary cassette.
- Releasing the pressure to change the replenishment bottles.

Working with these items does not change the method currently loaded.

Set Error Method

Set Error Method enables you to store the current parameters. These parameters are applied to the instrument when an error occurs. It ensures that the instrument shuts down in a controlled manner if ChemStation control is discontinued for any reason.

Identify Device

The command **Identify Device** causes the LED on the front cover to blink alternating in green and yellow for 4 seconds.

System Vialtable

The vialtable is a graphical tool which facilitates the management of vials in the tray. It can be used as an intelligent notepad, which exchanges its information with methods and sequences.

Some features are:

- If a vial is defined in the vialtable this definition (name of vial) will be used whenever the vial is referenced (method editing, method print).
- Consistency checks can be done in order to verify if there are vial conflicts between the method and sequence usage of vials.
- Documentation of vial positions and contents.

How to Prepare your Agilent CE Instrument for Analysis

To prepare the Agilent CE instrument for the analysis you need to do the following tasks:

- Start the Agilent CE instrument.
- Start the computer.
- Start the Agilent ChemStation software/CE user interface.
- Allow the lamp to warm up (approximately 1 hour).
- Prepare vials for sample and buffer.
- Insert a capillary into the alignment interface.
- Insert the capillary into the capillary cassette.
- Insert the capillary cassette into the system.
- Prepare the replenishment system (optional).

After you have completed all these tasks, you can start an Agilent CE method.

A CE method can be created in an online (CE instrument is on and connected) or offline installation of the Agilent ChemStation.

The detector lamp can be switched on automatically and unattended by scheduling this from the detector control menu. Please see the options for the detector under “Diode Array Detector” on page 179.

The detector lamp can be switched on automatically with each instrument start. Select the respective setting from the detector control menu (see “Diode Array Detector” on page 179).

Capillary Electrophoresis, CE

How to Use Your Agilent CE Instrument for Capillary Electrophoresis Separations

This chapter introduces method parameters for applications running in CE mode. This mode is the most suitable for applications in the field of capillary zone electrophoresis (CZE), micellar electrokinetic chromatography (MEKC) and capillary isoelectric focussing (CIEF). The current CE mode for your instrument can be selected under **Instrument < more CE < Instrument configuration...** . The current mode is visible in the second line of the CE control diagram. For detailed information, see "Working with the CE Diagram" on page 84 and "Graphical User Interface Explanation" on page 86.

Agilent CE Method Parameters

This section describes the parameters of an Agilent CE method for data acquisition and their meanings. Example sets of parameters for a method to analyze the test sample are in "Setting Up a Test Sample Run" on page 252. After you have completely set up the Agilent CE method and supplied the sample information, you can run your method. Choose **Run Method** from the Run control menu.

Overview

A convenient way to access the parameters of an Agilent CE method is the item **Setup Instrument Method** in the **Instrument** menu. This displays the CE **Method Setup** dialog box. Tabs with parameters for the DAD and CE part of a method can be edited on this screen. The left-hand side shows the most important parameters. The right-hand side offers several pages that can be expanded subsequently for editing.

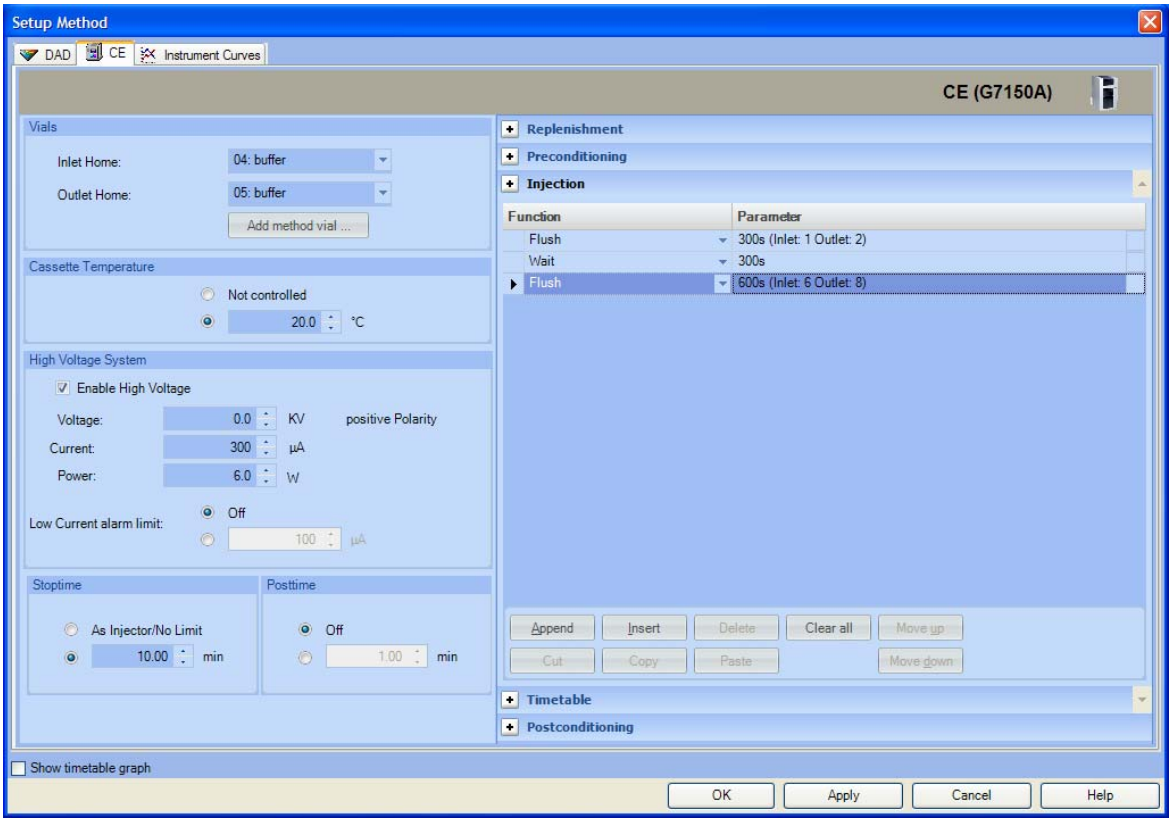


Figure 20 CE Method Setup

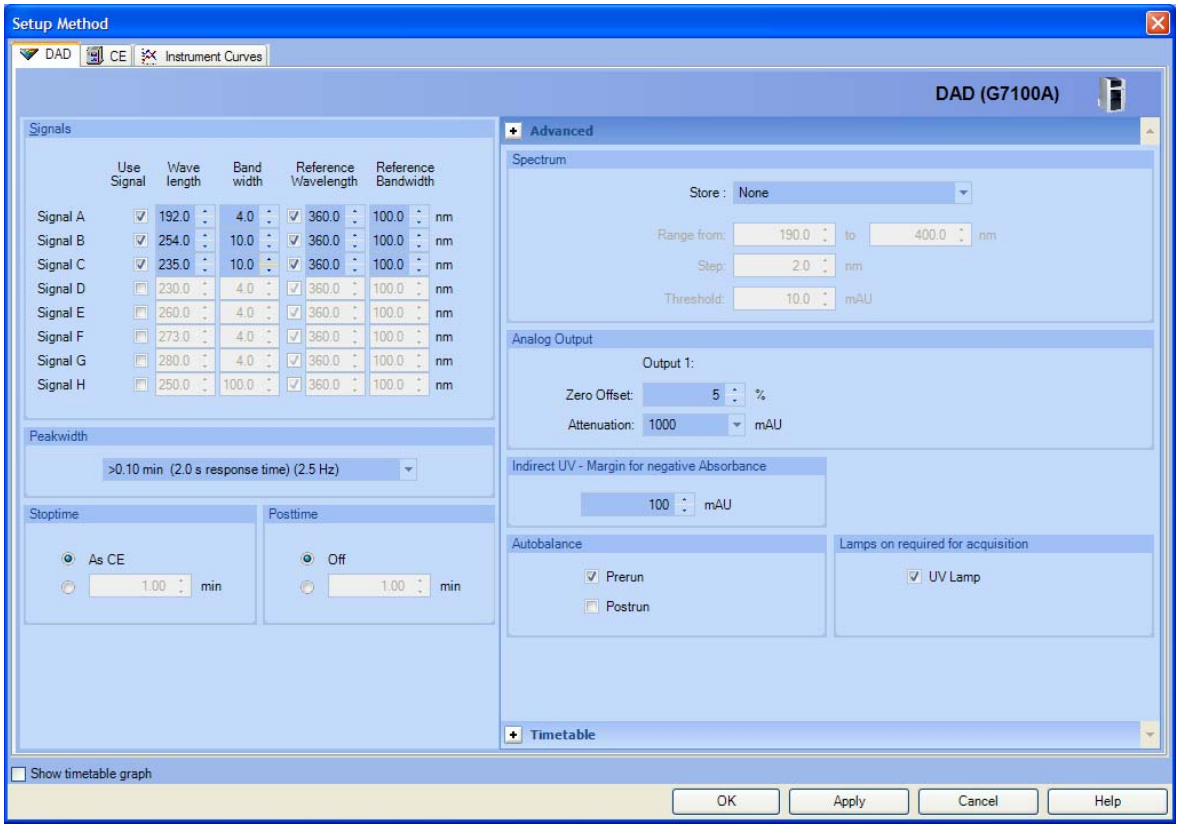


Figure 21 DAD Method Setup

Selecting **OK** transfers the parameters to the instruments and closes the dialog. Choosing **Apply** only transfers the current parameter to the instrument. Save the edited method, if appropriate.

If you do not save the method to the hard disk, this changed method is executed when choosing **Run Method**. When you refer to a method in a sequence, the method is always loaded from the disk. So if you did not save your changes using **Save Method**, the original method from the hard disk is used.

Method parameters are also available if **Method/Edit Entire Method...** is chosen. This dialog guides you through further parameters associated with a method such as

- Method Information
- Instrument / Acquisition
- Data Analysis
- Run Time Checklist

The book icon in the software toolbar is a further alternate entry point for method editing. When you click the icon, you can access menu items to set method parameters.

Vials

You can program a method to use certain vials as the inlet or outlet home vial. During electrophoresis, the electrodes and the capillary are in these vials. Vial numbers 1 to 48 or user vials (User 1 to User 10) can be selected. The selection can be done from the pull-down menu or by typing in the number with the keyboard. Clicking **Add Method Vial** allows you to enter vial names which will be visible in the vialtable.

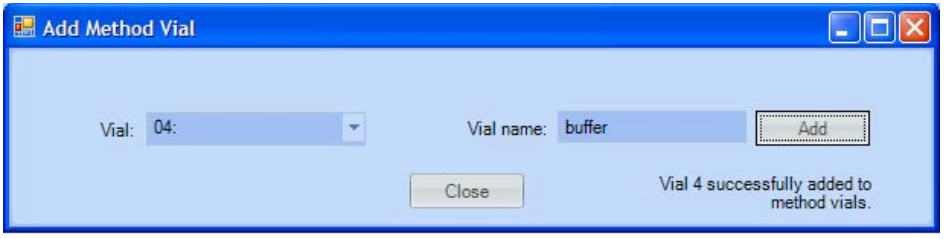


Figure 22 Add Method Vial

User vials are numbered from 1 to 10. User vials are placeholders in the method which are resolved by the sequence table at a later point in time. Usage of user vials is helpful for method optimization. Various buffer compositions can be tested with one common method. Creation of methods with variations of Inlet or outlet home vials can be omitted. Usage of user vials is also helpful to change buffers in long sequences to avoid over utilization of the buffer.

NOTE Vial numbers below 10 must be typed in with a preceding 0, for example 02 for a vial in tray location number 2, since the vials are numbered with two digits.

Cassette Temperature

The cassette temperature can either be set to not be controlled or to a certain setpoint. This setpoint must be within the instrument's specified range (see "Physical Specifications" on page 21).

The lowest applicable temperature is 10 °C below ambient temperature. The highest temperature is 60 °C.

The instrument is ready after the cassette temperature reaches the setpoint and stabilizes. A run can be started

The home values are activated at five points in your analysis:

- When a method is loaded.
- When you activate **Run Method** or **Run Sequence** from the **RunControl** menu.
- After injection is completed.
- After the stoptime has elapsed.
- After the entire analysis (including postconditioning) is completed.

NOTE

Keep the cassette temperature above the dew point or decrease the ambient humidity.

The instrument is specified to be operated at non-condensing conditions which is at humidity below 80% at 31 °C (87.8 °F). Please be aware: if the temperature of the cassette is below the dew point condensation might take place. Subsequently water condensate from the ambient might lead to arcing and damage of the cassette or instrument.

High Voltage System

The following parameters for the power supply can be controlled using the CE **Method Setup** screen in the Agilent ChemStation software:

- Enable High Voltage
- Voltage
- Current
- Power

In addition you can set a Lower Alarm Limit for Current.

NOTE In order to directly apply HV from the dialog associated with the HV icon (a battery) in the CE dashboard, the active instrument method must have **Enable High Voltage** check marked.

NOTE The maximum stored energy in the CE power-supply is below 200 mJ at 30 kV. Due to this and the fixed current limit of 300 µA the high voltage applied is not defined as hazardous voltage.

Positive voltage settings will configure the electrode at the inlet vial with positive values (positive polarity). Positive polarity is regarded as the standard setting.

You can reverse the polarity to negative by entering negative values for high voltage. This means that a negative voltage is applied at the inlet electrode.

The outlet electrode is always grounded to ensure that the potential at the point of detection is close to ground. Even with negative polarity, the inlet electrode is the point where the voltage is applied and the outlet electrode is close to ground.

Although the outlet electrode is always at the ground potential, you should make sure that the electrode is not short-circuited to ground. The electrode is connected to the power supply to measure the current flowing through the capillary. If the ground electrode is short-circuited to ground, all current flowing through the capillary is signaled as leakage current.

NOTE It is good CE practice to ramp up voltage instead of switching voltage suddenly to high values. This is regarded as gentle treatment for samples which might otherwise be affected by the field strength, such as proteins. A linear voltage ramp from 0 to 30 kV can be programed by starting with 0 kV and setting the voltage in the timetable to for example 0.2 minute.

Voltage, Current and Power

Voltage, current and power are related to each other by the resistance of your capillary/buffer system. You can set values for each of these three parameters. The individual values are treated as limits. The limit that is reached first applies. You can only enter absolute values for current and power.

If you only want to control the voltage and not the current and power, you can set those two to the system limit (typically: 300 µA, 6 W) and the system will permit the maximum value.

Lower Alarm Limit for Current

When using constant voltage mode, the current is normally the indicator of the stability of the system. A rapid current decrease or drop can indicate instability in the system. By setting a lower alarm limit you can define when you want to be warned of such instable conditions during the run.

Instable conditions can be caused by:

- No buffer in the capillary
- Air bubble in the capillary
- Clogged capillary
- Broken capillary

Current values are dependent on the buffer concentration, the type of buffer used, the inner diameter and length of the capillary, and the temperature. When running the Example Method for the Test Sample (see “Setting Up a Test Sample Run” on page 252) normal current values are below 50 µA.

If you set the lower alarm limit and the it is not exceeded 30 seconds after start of the run, the run is stopped. When the lower alarm limit is reached during the run part of the analysis (when the HV is applied), your current run is stopped. During a sequence the system continues with the next analysis.

Do not use the lower alarm limit or program the time if changing the inlet or outlet vial during the run (for example for fraction collection). Otherwise, the system will stop when changing the vial because the lower alarm limit is reached.

Posttime and Stoptime

The stoptime defines the time for your separation, also referred to as the run part of the analysis. It does not include replenishment, preconditioning, injection and postconditioning. After the stoptime has elapsed, the system changes from the run state to postconditioning or postrun (if defined) and then to the ready state.

The posttime is normally used for equilibration. It defines the time after the analysis, that is after the stoptime has elapsed and data analysis is completed. During the posttime the instrument is in the postrun state. After both stoptime and posttime have elapsed the instrument completes postconditioning and is then ready for the next analysis.

Replenishment

During multiple analyses, the composition of the buffer can change, for example the pH due to electrolysis. A simple way to refresh the buffer is to access different buffer vials in the tray which might be “user vials” in the method that are assigned to a certain tray position in the sequence table. This is more useful, for example, during method development.

Another way to change the buffer is replenishment. Replenishment can be programmed via the topmost table in the right side of the CE **Method Setup** screen. It is done either in parallel or serial to the subsequent conditioning operation. The associated timetable can be used to empty, fill or replenish vials to a certain height.

The replenishment system automatically empties and refills the buffer vials in the tray with new buffer from the electrolyte bottle. Therefore, the number of tray positions occupied by home vials is reduced and a maximum of sample vials can be loaded. Typically replenishment is done after every 3 or 4 runs. Depending on the stability of the running buffer, it is sometimes necessary to do it before each run. If you want to use the replenishment system, prepare it as described in “Preparing the Replenishment System if Needed” on page 111.

NOTE Using parallel replenishment, you can decrease the total time needed for your analysis, as replenishment and preconditioning are done at the same time. When using this feature, you have to make sure that vials used in conditioning are not replenished at the same time, otherwise you will have a vial conflict.

NOTE The time for a replenishment step can vary from vial to vial.

When using buffers containing detergent (for example SDS), replenishment may not fulfill your needs. The limit for SDS concentration is 70 mM. Do not exceed this concentration. Add some organic liquid to the waste bottle so that bubbles do not form. Also see "Problems with the Replenishment System and Buffers Containing SDS" on page 168.

Preconditioning

In order to have stable conditions for your analysis, it is important to condition capillaries.

Depending on the separation mode used it can comprise:

- conditioning the capillary with conditioning agents, and
- equilibrating the capillary with buffer.

These conditioning steps can be programmed using an expandable table in the right side of the CE **Method Setup** screen. The associated timetable can be used to apply pressure, apply voltage or flush between vials. Inlet and outlet vials can be loaded and wait time can be programmed here. If suitable, such steps can also be done as a postconditioning operation ("Preconditioning and Postconditioning" on page 143).

NOTE Condition capillaries according to their specifications. Fused silica capillaries are typically rinsed with alkaline or acidic solutions for conditioning. Please be aware that most coated capillaries will be irreversibly damaged by this.

NOTE To minimize contamination of buffer vials with conditioning solutions (such as NaOH) which might stick to the outside of the capillary or electrode, it is recommended to dip the electrode in an additional step in a large dedicated vial filled with buffer prior to letting the instrument load the actual inlet and outlet home vials with run buffer. This precaution can be programmed into the timetable by a combination of the commands "load vial" and "wait".

Wash Inlet Electrode (New Command to Avoid Carry-over in Critical Applications)

During precondition and postconditioning a command for emptying the space between capillary and electrode can be executed. The command is dedicated for applications with aqueous buffers and consists of application of slight vacuum to the inlet vial while lowering the inlet vial. This leads to opening of an internal sealing of the electrode and an airstream inside the wash vial at the inlet lift. Liquid stored in the space between capillary and electrode is removed. It is recommended to perform this prior to a flush step with run buffer in case of carry-over critical applications. The wash inlet electrode command is not available for the outlet electrode. At the inlet lift a dedicated wash vial should be present. Using the Wash Inlet Electrode commands leads to injection of a small volume on the outlet side (equaling approximately 50 mbar x 3 s for a 50 µm capillary). Therefore, position at the outlet side a vial with run buffer or any other suitable run buffer vial. Empty vials at the outlet lead to air in the capillaries which needs to be flushed out again.

NOTE

Usage of short electrodes (part number **G7100-60033**) in combination with pressure injections also reduces this type of take over greatly (insert #reference to injection section). Short electrodes are shorter by 5 mm, sample is filled only at low level and so the electrode does not touch the sample.

Injection

You have several choices for CE injection:

- Hydrodynamic injection (by pressure or vacuum)
- Electrokinetic injection (applying a voltage, current or power)
- Using an injection program

The injection parameters can be programmed using an expandable table in the right side of the CE **Method Setup** screen. The associated timetable can be used to apply pressure, apply voltage or flush between vials. Inlet and outlet vials can be loaded and wait time can be programmed here. After the injection has finished, the analysis starts with recording detector signals to result file.

Hydrodynamic Injection

With hydrodynamic injection, the inlet buffer reservoir is replaced with the sample vial. A pressure is applied for a certain time to introduce the sample in the capillary. The system constantly controls the pressure and corrects for the rise time effects of valves and the compressibility of air. When pressure is applied, the pressure to the sample vial is increased gradually to its setpoint after which the pressure decreases gradually to approximately a fifth. Then a correction time is inserted after which the pressure decreases gradually to atmospheric pressure. This results in accurate and reproducible injection, as well as exceptional injection linearity.

Injection by pressure is the most frequently used injection technique. There are no differences in injection concentration for molecules with different mobilities as in electrokinetic injection.

With viscous buffer system the flush command can be used. However, injection of sample to the capillary at this high pressure is not monitored by the self-correcting injection algorithm. This sample application to the capillary is therefore less reproducible. To compensate for this, internal standards might be useful in quantitative analysis.

Electrokinetic Injection

For electrokinetic injection the inlet buffer vial is replaced with the sample vial. A voltage, current or power is applied for a certain time that causes the sample to migrate into the capillary.

This injection technique is often used for capillaries filled with fixed or cross-linked gels or other high-viscosity material , where injection by pressure is not applicable.

During electrokinetic injection, molecules with different mobilities will be depleted differently from the sample solution, therefore gradual changes in analyte composition might occur as a consequence of multiple injections.

Different salt contents in the sample matrix will influence the injection efficiency of the analytes. Variation in the matrix composition might therefore bias the quantitative analysis and, in the worst case, hamper analyte introduction.

Difference Between Hydrodynamic and Electrokinetic Injection

To do electrokinetic injection, the electrode must touch the sample in the sample vial. In contrast with hydrodynamic injection the sample only needs to touch the capillary tips.

Short electrodes (**G7100-60033**) in combination with hydrodynamic injection are used to minimize sample carry-over to other vials. At appropriate low-fill volumes present in the sample vial during injection, electrodes are not submerged. With this procedure there is no interaction between sample and electrode, such as electrochemical reactions or adhesion of sample to the electrode.

NOTE This precaution can be programmed into the timetable by a combination of the commands “load vial” and “wait”.

Using an Injection Program

The injection table is used for advanced injection tasks such as:

- Injection from different vials, for example ITP.
- Multiple injection modes, for example spiking.
- Injecting a buffer plug after the sample to prevent sample loss after applying voltage.

The online help provides more information on this.

Timetable

In the **CE Timetable**, present on the right-hand side of the CE **Method Setup** dialog you can choose to set and change values for the following parameters at a certain time during the run:

- Voltage
- Current
- Power
- Pressure
- Inlet vial
- Outlet vial
- Cassette temperature
- Lower alarm limit for current
- High pressure (only in CEC mode)

Time programming of these parameters can be useful for example to:

- Define gradients (for voltage or temperature).
- Change the buffer during the analysis (inlet and outlet).
- Apply pressure during the analysis.
- Change the outlet vial during analysis.
- Change the alarm limit for current for example, when changing the buffer system during the analysis.

Instrument Curves

Using a further tab in the CE **Method Setup** dialog box you can choose to monitor and store the following CE-specific raw data. If selected, they are stored in addition to the detector signals defined:

For the CE:

- Leak current
- Internal pressure
- Replenishment level pressure
- Vacuum
- Injection pressure
- External pressure
- Tray temperature
- Cassette temperature

For the DAD:

- Board temperature
- Optical unit temperature
- UV lamp anode voltage

Detector Parameters

The parameters for the detector are set in the DAD tab of the **Method Setup** dialog used in the Agilent ChemStation (see Figure 20 on page 93). On the left hand-side you can define the following settings:

- Used signals, detection and reference wavelengths, bandwidths
- Peak width or detector response time
- Detector stoptime and posttime

Signals, Wavelengths and Bandwidths

Detector parameters allow you to define the detector signals you want to acquire during the analysis and store in the data file. For each signal the wavelengths and bandwidths of sample and reference wavelengths are defined.

It is recommended to do runs without using reference wavelengths to minimize baseline noise. Reference wavelengths can help to compensate for signal drifts. As reference wavelengths are usually measured at higher wavelengths, the baseline noise is increased when using reference wavelengths. Therefore, it might be appropriate to record the two signals at the same wavelength; one using the reference wavelength and one without.

The signal you want to store in the data file is displayed below the lamp icon of the DAD tab of the instrument diagram.

Peak Width

The peak width sets the optimum response time of your detector. If you have similar peak widths in your electropherogram, set it to the width of one of the peaks in your electropherogram. If the peak widths are very different you can use the detector timetable to adjust the peak width setting during the analysis. If your peak width setting is too narrow, peaks might be not detected automatically. This will lead to no spectra for the wider peaks being acquired and in case of peak dependent detection.

Spectra

On the right-hand side of the DAD **Method Setup** dialog an expandable page for advanced settings is visible.

Under **Spectrum** you can define at which points on a signal, spectra will be taken and saved. You can choose to acquire them:

- At the upslope, apex and downslope of the peak
- All in a peak
- All spectra during analysis
- Every 2nd spectrum

  or

- None

You can combine this setting with a wavelength range. By restricting the wavelength range to the range of your interest you can save some disk space; the size of your data files will be smaller because the full spectrum is not stored.

A peak height threshold avoids spectra that are taken from small peaks.

If spectra are recorded, a spectra icon is visible in the detector diagram of the graphical user interface.

Detector Stoptime and Posttime

You can define a special stoptime and posttime for your detector. If you want to use the times set for the Agilent CE instrument, set them to as CE.

Analog Output

The **Analog Output** section enables you to set up the zero offset and attenuation of the analog output signal.

Indirect UV

The section **Indirect UV** enables you to set a margin for peaks with negative absorbance. Set it as close to the baseline as possible but allowing enough range for the negative peaks you expect to get. The higher the value, the lower the resolution of the detector, and the greater the baseline noise. Set this value only if you expect negative absorbances greater than -100 mAU.

Autobalance

Enables you to zero the baseline of the diode-array detector before or after an analysis. You can use the autobalance feature to ensure that the baseline is reset to zero either before the Prerun time has elapsed, or after the Postrun time has elapsed.

Lamps On Required for Acquisition

Deselect the parameter **Lamp on required for analysis** if you also have a different detector configured than the built-in DAD. Such a detector could be an MSD (mass sensitive detector), LIF (laser induced fluorescence) or a CCD (contactless conductivity detector). This option allows you to save lamp life time.

Detector Timetable

Using the **Timetable** for the detector, you can program the time for the following parameters during your analysis:

- Measuring wavelength for signals A to H,
- Measuring bandwidth for signals A to H,
- Reference wavelength for signals A to H,
- Reference bandwidth for signals A to H,
- Spectra acquisition mode,
- Peak width
- Threshold.

By programming the time for these parameters you can optimize the required disk space for your spectra by switching the spectra acquisition on and off. Thus, you can acquire spectra for parts of the electropherogram only.

Switching the Lamp On

The lamp can be switched on automatically as part of initialization (see "DAD Control" on page 180).

To switch the lamp on or off manually:

1 In the DAD diagram click the lamp icon. A menu will offer the option to switch the lamp on or off depending of the current status. Please see Figure 23 for the different lamps statuses in the DAD diagram.

Figure 23 UV lamp status Off, Ignition, On

2 To ignite the lamp from the menu go to **Instrument > More DAD > UV Lamp** and select **Switch Lamp On** or **Switch Lamp Off**. Please see Figure 23 for the different lamps statuses in the DAD diagram.

3 Prior to a run, allow the lamp to warm up for about 1 hour.

If the warm up time of the lamp is too short, a baseline drift in the electropherogram may occur.

Preparing the Replenishment System if Needed

During multiple analyses, the composition of the buffer can change. One way to refresh the buffer is replenishment.

The replenishment system automatically empties and refills the buffer vials in the tray with new buffer from the electrolyte bottle. Typically, replenishment is done before every or after every 3 to 4 runs, depending on the stability and volume of the running buffer.

If you do NOT want to use the replenishment system, you still have to put empty bottles (electrolyte and waste) into the replenishment system at the bottom of the instrument. The bottles are also used as a pressure and vacuum reservoir. Missing bottles lead to pressure and/or vacuum error messages.

WARNING

System under pressure

Pressure is applied to the bottles.

- Only use bottles with part number **9300-1748** or **5042-6478** with this instrument. These bottles have a protective coating.

If you want to use the replenishment system, you have to fill the electrolyte bottle with buffer. Use about 100 mL to make sure the frit is submerged in buffer. Do not fill more than 400 mL buffer into the bottles to ensure the system can work properly. When using buffers containing detergent (for example SDS), the waste bottle should contain some liquid (for example a few mL of isopropanol) to destroy the detergent bubbles. Detailed information on buffers is given in the primer *High Performance Capillary Electrophoresis* (**5990-3777EN**), delivered together with the instrument or numerous application notes available on our web page.

Make sure the waste bottle is empty so it can hold the same amount of liquid as in the electrolyte bottle.

CAUTION

Instrument damage by corrosion

Components of the replenishment system can be damaged by aggressive or corrosive buffers, organic solvents or evaporated components from these.

- Avoid using aggressive or corrosive buffers or organic solvents that can damage the liquid handling system. Buffers for replenishment or evaporated components from these buffers will come into contact with the following material: polytetrafluoroethylene (PTFE), stainless steel (SST, Grade 316), fluorine rubber (FPM, Viton), polyaryletheretherketone (PEEK), perfluoro-ethylene-propylene (FEP), glass (filter + bottles). A typically acceptable pH range is pH 3-11; for example formic acid can be used in concentrations up to 0.1 %.
- If you would like to use a buffer composition exceeding the given conditions, we recommend running an analysis without using the replenishment system but individual vials.

Before Filling the Replenishment System

The replenishment system (bottles and tubing) should be cleaned when:

- Using it for the first time.
- Changing the replenishment buffer.
- If the replenishment system will be idle for some time.

Filling the Replenishment System

To prepare the replenishment system.

1 Click one of the replenishment bottles in the CE diagram.

2 Choose **Change Bottles** to release the pressure before you open the bottles.

3 Open the front door at the bottom of the front panel.

WARNING

Hazardous organic solvents and sample residues

The waste may contain organic solvents and residue from your sample.

- Wear rubber gloves and safety glasses when handling electrolytes and deposit the waste in a safe waste container.

4 Take out the electrolyte bottle and unscrew the cap. The electrolyte bottle has a frit and tubing inside. Avoid contaminating the frit (see Figure 24 on page 113).

Filling the Replenishment Bottles

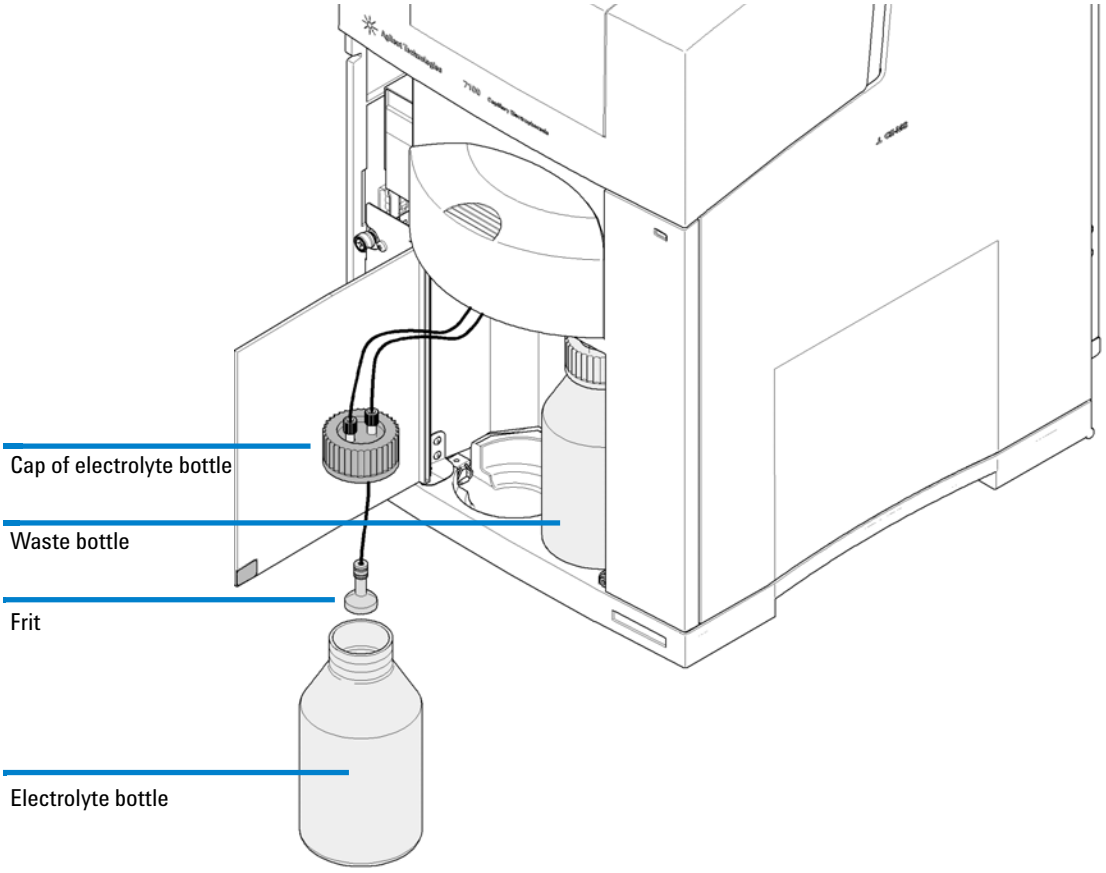


Figure 24 Filling the replenishment bottles

1 Make sure the buffer is filtered; use a 0.25 µm filter. For buffers with a high viscosity, a larger pore size, for example, 0.45 µm is also suitable.

2 Fill the electrolyte bottle with buffer.

   For 500 mL bottles (part number **9300-1748**), use a minimum of 100 mL to make sure the frit is submerged in buffer. Use a maximum of 400 mL. For 100 mL bottles (part number **5042-6478**), use a minimum of 40 mL to make sure the frit is submerged in buffer. Use a maximum of 80 mL.

3 Tighten the cap.

   Make sure the cap is tightened firmly, as pressure will be applied to the bottle.

4 Choose **OK** in the **Change Bottles** dialog box.

   Wait until the pressure has built up again, that is the instrument reaches the ready state.

The right-hand bottle is the waste bottle. It is used to store buffer emptied from vials in the tray. Empty the bottle whenever you refill the electrolyte bottle, following the same procedure as described above. Empty the bottle frequently. The error message "Waste Bottle Full" appears if the waste bottle is full.

Preparing Vials for Buffer and Sample

Vial Handling

- Only use only recommended vials (see Table 4) when working with the Agilent CE instrument.
- It is recommended cleaning the vials prior use (flush them with water and some alcohol, use compressed air to dry them), otherwise particles may enter the capillary (current problems or blocked capillary).
- All vials must be capped. Use recommended caps only, see Table 23 on page 116.

WARNING

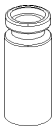
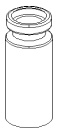
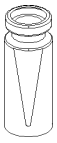
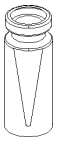
Instrument damage

Avoid damage to the pre-puncher, electrodes and lifter.

- Do not use crimp caps or any other metal caps when working with the Agilent CE instrument.

- Make sure there are no air bubbles in the vials, especially when using microvials for samples. Current problems may occur or, in the worst case, the capillary may break (heat generation or no conductance to the outlet buffer).
- Ensure an adequate liquid level for sample, buffer and waste vials. See Figure 25 on page 117.

Table 23 Recommended vials and caps for the Agilent CE instrument

Item	Description	Part Number	To Be Used For
	Vial clear glass 2 mL Pack of 100 Pack of 500 Vial amber glass 2 mL Pack of 100 Pack of 500	 **5182-9697** **5183-4623** **5183-4619** **5183-4622**	Sample and buffer
	Vial polypropylene 1 mL Pack of 100	**5182-0567**	Sample and buffer
	Vial polypropylene glass lined 100 µL Pack of 100	**9301-0977**	Sample only
	Vial polypropylene 100 µL Pack of 1000	**9301-0978**	Sample only
	Snapcap polyethylene olefin septum for chemical resistance ('white' color) Pack of 100 Pack of 500	 **5181-1507** **5181-1513**	Sample and buffer, but not for multiple use
	PUR polyurethane septum. Preferred **standard caps** ('clear' color) Pack of 100	**5181-1512**	Sample and buffer

The recommended maximum liquid level in the vials is 1.8 cm measured from the bottom of the vial (see Figure 25). The minimum level depends on the type of liquid the vial is used for (sample, buffer or waste).

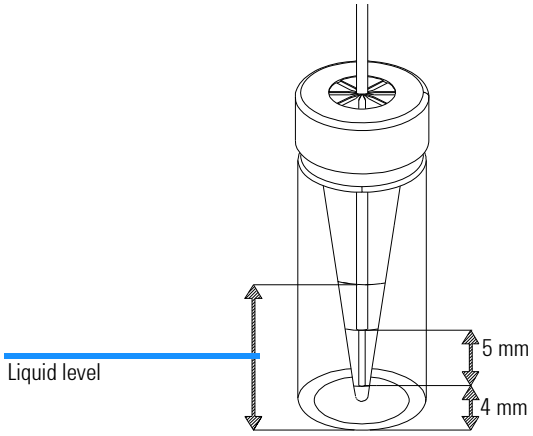


Figure 25 Liquid level and lift offset for standard electrodes

NOTE

To touch the standard electrodes (part number **G7100-60007**), the liquid level must comply with the minimum condition:
Liquid Level = L = Lift offset + 5 mm up to electrode + 1 mm guard band = 1 cm. See Figure 25.

For short electrodes (part number **G7100-60033**), the liquid level must comply with the minimum condition:
Liquid Level = L = Lift offset + 10 mm up to electrode + 1 mm guard band = 1 cm.

To touch the capillary, only the liquid level must comply with the condition for both types of electrodes:
Liquid Level = L = Lift offset + 1 mm guard band = 0.5 cm

Sample Vials

The level of sample in the vials depends on the injection technique used. Please see the section "Injection" on page 103.

Hydrodynamic Injection

When using injection by pressure, the sample level only needs to touch the capillary. The minimum liquid level in the sample vials for this technique is 5 mm for standard and short electrodes. The short electrode filling height should not exceed 6 mm. This electrode is designed to minimize take-over of sample that absorbs to or simply coats the electrode.

Electrokinetic Injection

When using injection by voltage or current, the sample level needs to touch the electrodes. Therefore, the minimum liquid level in the sample vial is 10 mm. Short electrodes (**G7100-60033**) are not suitable for electrokinetic injection.

NOTE

The effective length in capillary electrophoresis, defined by the distance from the injection end to the detector, generally ranges from 40 to 75 cm. Much shorter effective lengths, such as 8.5 cm from outlet side to the detector are also sometimes very useful. Short effective lengths have the advantage of reduced analysis times, as well as improved peak efficiency and sensitivity.

Hydrodynamic or electrokinetic injection from the short end of the capillary can be achieved by placing the sample vial at the outlet, the buffer vial at the inlet, and then applying a vacuum or a respective electrical field. With the Agilent CE system, up to 100 mbar pressure or vacuum can be applied to the inlet to inject sample at the inlet and outlet, respectively.

Buffer Vials

When the run is started, the liquid level in the vial should touch the electrodes to enable a current to flow. Therefore, the minimum liquid level in the buffer vials is 1 cm for standard electrodes and 1.5 cm for short electrodes. A buffer level of 1.4 cm is recommended for standard electrodes and 1.8 mm for short electrodes. You can use the replenishment system to fill the buffer vials. You can also use the replenishment system to precisely lower the liquid level for all buffer vials to an equal height if you overfill them initially.

Outlet Vials

Outlet vials (for example, waste vials) should also be filled with enough liquid to touch the capillaries. Thus, the liquid flow through the capillary does not produce droplets at the capillary end, which can cause pressure. This would influence the injection amount. If the waste vial is filled with liquid, outgoing droplets cannot be drawn up the electrode by capillary effects but are flushed completely out of the outlet electrode. Therefore, they cannot contaminate the lift head or the next outlet vial. Outlet vials that are used during analysis (for example, for fraction collection) need to be filled to a higher level (1 cm). The liquid must touch the electrode to enable a current to flow.

Vial in Position 49 (Replenishment Lift)

Using replenishment, it is good practice to have a capped vial filled with buffer or water in position 49 (= home position of the replenishment lift). The replenishment needle stays in the liquid and is prevented from buffer precipitation and the resulting blockage of the needle. Water in vial 49 can change the buffer composition inside the replenishment needle and the adjacent tubing over time due to diffusion. This effect might influence the reproducibility of analysis. Therefore, we recommend using buffer.

Inserting the Vials

The tray of the Agilent CE instrument is used for both buffer and samples. The CE diagram of the Agilent ChemStation controls the tray.

1 From the CE diagram open the control menu by clicking the tray icon.

2 The dialogue **Get Vial...** allows you to enter the vial number or tray position.

3 Wait until the tray has stopped moving.

4 Open the tray door.

5 Access the vial which is in the front.

The number is engraved in the sample tray.

NOTE For safety reasons, the tray can only be moved by the Agilent ChemStation when the tray door is closed.

6 Click **Done** after you have accessed all the vial positions you need.

The tray will perform a complete turn every time the tray door is closed in order to read-out the occupied tray positions with an internal vial sensor. Methods will only run if all specified vials are present. The vial sensing procedure might also be delayed if any operation prevents the vial handler temporarily from turning.

Manual Operation

If you want to operate the tray manually or access positions of the tray, it is recommended that you remove the vials from the lifts first. This avoids the need to fill the positions for those vials in the tray again. Use the **Unload** option in the individual lifter context menus to remove the vials from the lifts.

During the run, you can access the vial tray any time the software is not trying to access it. If you try to access the tray during the run, you cannot remove the vials from the inlet and outlet lifts. Therefore, you have to be careful not to fill the positions for those vials in the tray again. Check in the CE diagram which vials are currently located in the lifts.

NOTE If you insert a vial in a tray position that is already occupied, but where the vial is currently loaded to a lifter, a message will request that you remove the duplicate vial. A duplicate vial is brought to the front position.

Positioning Vials for Sample and Buffer

1. Note the positions of the vials in the table (see "System Vialtable" on page 90).
2. Fill the sample into a sample vial and put the vial in the tray, for example in position 7. This position is used in the **Sample Information** screen or the **Sequence Table** screen later.
3. Fill at least two vials with the buffer you want to use for your analysis.
4. Position those vials in the sample tray. For example, use positions 5 and 6. Write down the positions. When creating the Agilent CE method you must enter the positions of the buffer vials as CE **Home Values** for the inlet home and outlet home vial. After the sample has been injected, those two vials are positioned at the two electrodes.
5. When using the replenishment system, you can start off with empty buffer vials and use the replenishment system to fill them automatically with buffer.

Removing the Capillary Cassette from the Agilent CE Instrument

Your Agilent CE instrument comes with an empty capillary cassette installed.

To remove the capillary cassette from the Agilent CE instrument, you have to do the following steps:

1 Choose the cassette icon in the CE diagram and select **Change Cassette...** from the menu. This removes the buffer vials from the ends of the capillary abd places them back to their position in the tray. This will take approximately 5 seconds.

2 Open the top cover to access the cassette. Press a spring located in the middle of the front lid to release the latch. Figure 26, “Position of installed cassette,” on page 122 shows the position of an installed cassette.

NOTE If you do not lower the vials from the loaded position, buffer, which may be transferred via the capillary into the electrode inserts, precipitates and may block the electrodes or damage the capillary.

3 Move the cassette guide to the front.

4 Carefully pull the cassette out of the cassette guide. See Figure 27 on page 123.

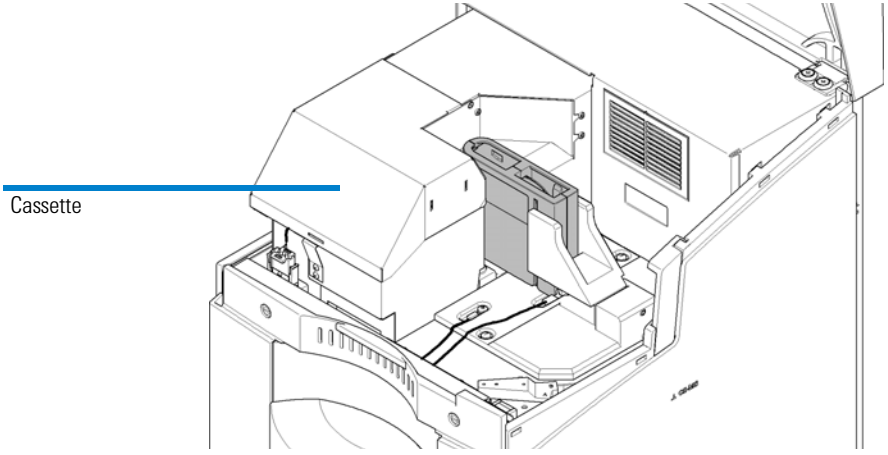


Figure 26 Position of installed cassette

NOTE The DAD detector is equipped with a white LED located near the outlet electrode. This light will assist you when inserting the capillary.

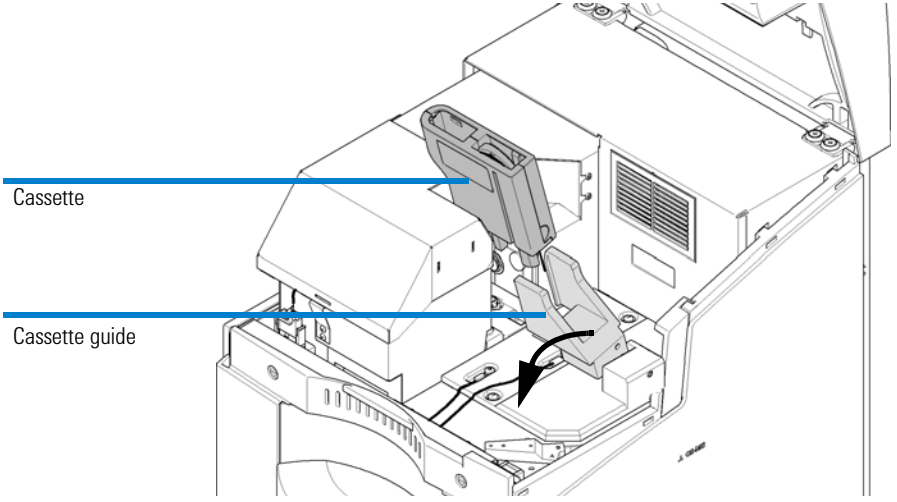


Figure 27 Removing the cassette

Installing a Capillary in the Alignment Interface

The following procedure describes how to install a capillary into an alignment interface. A capillary must have an alignment interface installed before it can be installed into the capillary cassette in order to align the inner capillary with the light path of the diode array detector

Material Needed to Install a Capillary in the Alignment Interface

- Capillary
- Corresponding alignment interface
- Capillary insertion tool (separate item) or part incorporated in cassette
- Safety glasses

WARNING

Risk of injury of sharp capillary ends.

Sharp capillary ends can injure your eyes or skin.

- Wear safety glasses when opening the cassette and handling the capillary to protect your eyes and body.

NOTE

Alignment interfaces for the 7100 CE instrument differ from alignment interfaces for earlier instruments. Interfaces from earlier instruments do not fit into the diode array detector block.

Color Coding of Capillaries and Alignment Interfaces

The alignment interface must correspond to the type of capillary used. There are special alignment interfaces for straight capillaries and for extended light path capillaries. The alignment interface must also correspond to the inner diameter of the capillary. To make it easier to match the capillary and corresponding alignment interface, we use the following color coding on both the sleeve of the alignment interface and the plastic stop on the capillary.

Table 24 Alignment interfaces

Sleeve Color	Part Number	Used For*
Black	G7100-60150	25 µm id capillaries with extended light path
Green	G7100-60210	50 µm id straight capillaries
Red	G7100-60230	50 µm id capillaries with extended light path
Blue*	G7100-60310	75 µm id straight capillaries
Yellow	G7100-60330	75 µm id capillaries with extended light path

* Use the blue alignment interface for 100 or 150 µm id capillaries

1 Make sure the color of the sleeve in the alignment interface matches the color of the plastic stop on the capillary.

2 Remove the protective plastic cap that covers the detection window.

NOTE

The capillary is very fragile at that point and it is important to keep the detection window clean.

- Do not touch the capillary at the detection window or the capillary tips, where the polyimide is burnt off.
- Clean the detection window and the capillary tips as described. Put the insertion tool on a flat surface, for example, your lab bench.

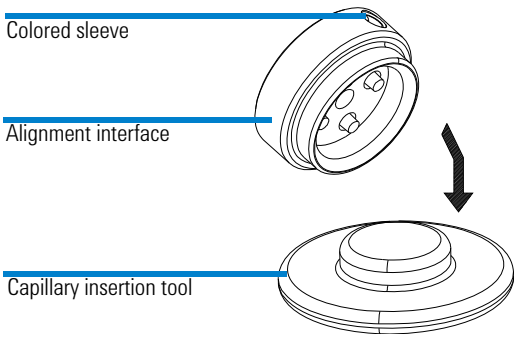


Figure 28 Alignment interface and insertion tool

3 Put the alignment interface on the insertion tool and press down firmly. Press only on the outer ring to release the spring that secures the capillary in the alignment interface.

NOTE

Four plastic pins in the alignment interface belong to a feather-driven mechanism to fix the capillary tight in an optimal position for the light path. Press these pins with the alignment tool when inserting a capillary. Insertion attempts of capillaries without this can damage capillary ends and may lead to dissatisfying results.

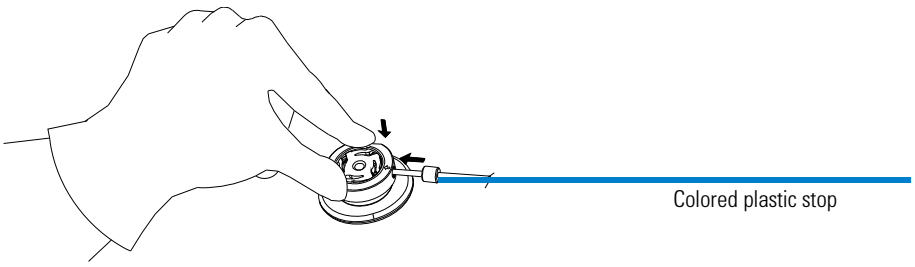


Figure 29 Alignment interface and insertion tool

4 Slide the capillary through the opening in the direction of the arrow printed on the interface.

5 The capillary has a plastic stop fitted. Pull the capillary through the alignment interface until the stop is reached.

6 While still slightly pulling the capillary, stop against the alignment interface, and release the alignment interface from the installation tool to secure the capillary in the alignment interface.

The detection window or the extended light path of the capillary must be visible through the detection interface. If aligned correctly, you can see the slit of the interface behind the detection window. See Figure 30 on page 127.

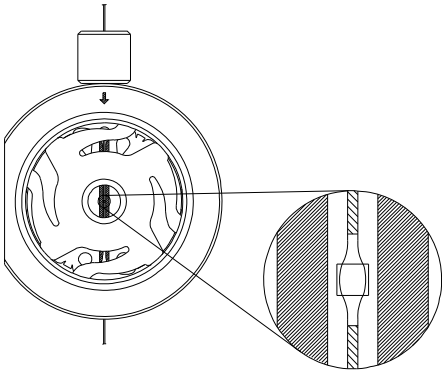


Figure 30 Extended light path aligned correctly

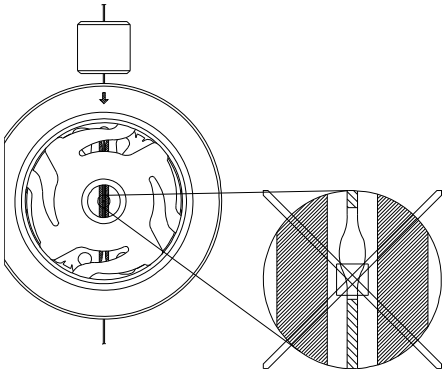


Figure 31 Extended light path aligned incorrectly

Installing a Capillary in an Empty Capillary Cassette

This procedure describes how to install a capillary in an empty capillary cassette. If the cassette has already been installed in the Agilent CE instrument, remove it as described above.

What You Will Do

1 Open the capillary cassette.
2 Install the capillary in the empty cassette.
3 Close the capillary cassette.

WARNING

Risk of injury of sharp capillary ends.

Sharp capillary ends can injure your eyes or skin.

- Wear safety glasses when opening the cassette and handling the capillary to protect your eyes and body.

Open the Capillary Cassette

1 Place the cassette flat on a solid surface with stabilizing pins to you.
2 Hold the bottom part (for example with both of your thumbs) and slide the top part 8 mm (0.3 inch) gently towards you.
3 Lift and remove the top part.

NOTE

Do not use excessive force to open the cassette. This might break parts inside the cassette.

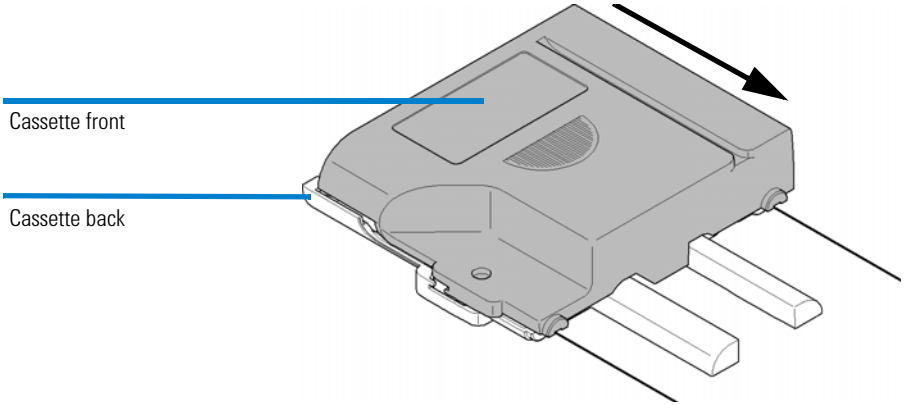


Figure 32 Opening the cassette lock

Installing the Capillary

1. Hold the capillary at the alignment interface.
2. Insert the alignment interface into the alignment interface holder on the cassette. Make sure the flat side of the alignment interface is at the outer edge of the cassette, see Figure 33 on page 130.
3. Make sure the capillary slides into the capillary guiding slit and a guiding hook above the area of the alignment interface.
4. Wind the capillary around the reel in the center of the capillary cassette.

   The pins surrounding the reel have grooves to secure the capillary.

5 Start with the inside of the upper pin to prevent the capillary from being squeezed when the cassette is closed.

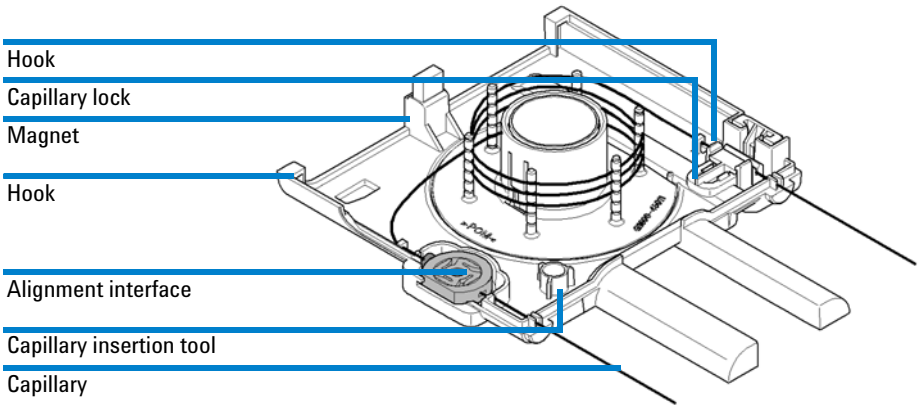


Figure 33 Installing the capillary

Alternate the sides of the pins when inserting the capillary.

NOTE

Make sure the windings of the capillary do not come into contact with each other. As the heat cannot be conducted away at contact points they may get hot and cause separation and detection problems. Such a contact point might also be a predetermined breaking point for arcing.

6 Insert the other end of the capillary into the guiding hook on the right.

7 Press the white capillary lock towards the center of the cassette and insert the capillary into the capillary lock. Release the capillary lock to secure the capillary.

8 Make sure the two capillary ends outside the cassette are the same length as the cassette guiding pins (see Figure 33 on page 130, alignment position) and are parallel to the pins. Use a sheet of paper or another soft item with a straight line to check this. Use the capillary lock to make adjustments on the inlet side.

Closing the Capillary Cassette

1. Place the top of the cassette onto the bottom part with an offset of 8 mm (0.3 inch).
2. Hold the bottom part and slide the top part towards the top of the cassette until it clicks into place.
3. Make sure the cassette cover and body form one unit
4. Make sure the two capillary ends outside the cassette are both the same length as the cassette guiding pins and are parallel to them. Use the capillary lock to make adjustments to the inlet side of the capillary. The capillary end on the outlet side is fixed; it cannot be moved.

Inserting the Cassette

NOTE Use the **Change Cassette** task from the CE diagram to access an already installed cassette.

To insert the capillary cassette into the system you have to perform the following steps.

1. Choose the cassette icon in the CE diagram and select **Change Cassette...** from the menu.

   This removes the buffer vials from the ends of the capillaries and back to their position in the tray. This will take approximately 5 seconds.
2. Open the top cover to access the cassette.
3. Press a spring located in the middle of the front lid to release the latch.

   Figure 34 shows the position of an installed cassette.

4 Move the cassette guide to the front.

NOTE Extracting the cassette from the instrument without lowering the lifts will lead to a higher contamination of the inner parts of the electrode or pre-puncher. Crystallization or liquid residue of this contaminations might bias future runs.

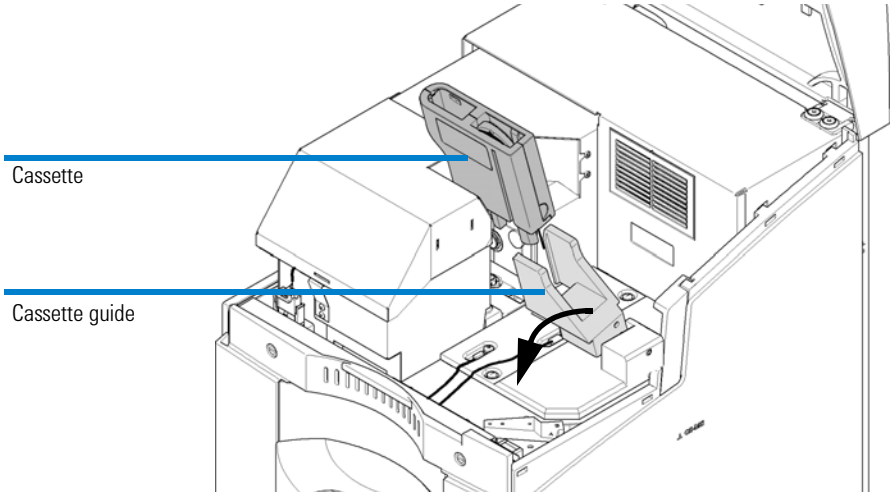


Figure 34 Insertion of cassette

CAUTION Capillary damage by incorrect insertion into capillary seats

The capillaries should slide directly into the capillary seats. Otherwise, they might break or be damaged.

- Make sure the ends of the capillary are not bent when lowering the capillary cassette.
- If you have problems inserting the capillary into the electrodes, check if they are blocked with salt crystals (see "Cleaning the Electrodes, Pre-punchers and Insulation Plate" on page 196).

5 Slowly lower the cassette until it reaches the insulation plate. While lowering the cassette, insert the capillary ends into the capillary seats of the electrodes.

6 Move the cassette guide back again while holding the cassette down. The alignment interface aligns the capillary automatically with the detector.

NOTE Only alignment interfaces dedicated to the 7100 CE instrument will fit. Interfaces from different instruments will not fit and will lead to unsatisfactory results.

CAUTION Damage to the cassette

Closing the top cover with an improperly installed cassette may damage the cassette.

- Do not close the top cover, if the cassette is not properly installed.

7 Close the top cover and secure it by latching it onto the body of the case.

For safety reasons, no power is applied if the top cover is open.

Because the cassette was changed, the Agilent ChemStation automatically performs the wavelength calibration in the background. It tests the wavelength calibration of your detector and advises you to make adjustments, if necessary.

If the lamp is off or the cassette is not inserted properly, the wavelength cannot be adjusted correctly.

8 Close the **Change Cassette** dialog box by choosing **OK**, enter the capillary information and proceed to setting up a method.

One of the following not ready conditions may appear in the status display of the Agilent ChemStation. Move the mouse over the status display to read the not ready conditions:

- Recalibration necessary
- UV lamp not ready

To correct for these not ready conditions please reinsert the cassette. Make sure the alignment interface snaps onto the ceramic interface of the detector and is not occluded. Make sure the lamp is ignited.

Fraction Collection

In the bioscience and pharmaceutical sectors, the capability of fraction collection is frequently required in order to characterize separated components by off-line analysis techniques such as MALDI/TOF-MS or protein sequencing.

All 7100 CE instruments allow fraction collection. This feature will be fully available in future Agilent ChemStation software revisions. Please check regularly for updates at **http://www.agilent.com** in the internet.

Capillary Electrophoresis, Plus High Pressure CE+p

The Agilent CE instrument is capable of accepting an external gas pressure in addition to the internal pressure. The external high pressure source can be up to 15 bar (218 psi), and is regulated within the instrument via method settings or with direct instructions from the CE diagram between 2-12 bar. This pressure can be applied to one or both vials at the capillary ends. The high pressure option may be required if using highly viscous replaceable gels in the CGE.

Requirements

- External pressure supply (< 15 bar) of oil-free air or nitrogen.
- Push-fit connector and gas line (supplied in startup kit).
- Outlet lift connection to the tubing system

NOTE For external pressure supply, a male adapter fitting the instrument's female adapter and PTFE tubing (1/8" OD x 1/16" ID PTFE tubing) are part of the accessory kit of the instrument. Please add a suitable connector to the external pressure supply.

The inlet for the external high pressure gas is situated at the back of the instrument:

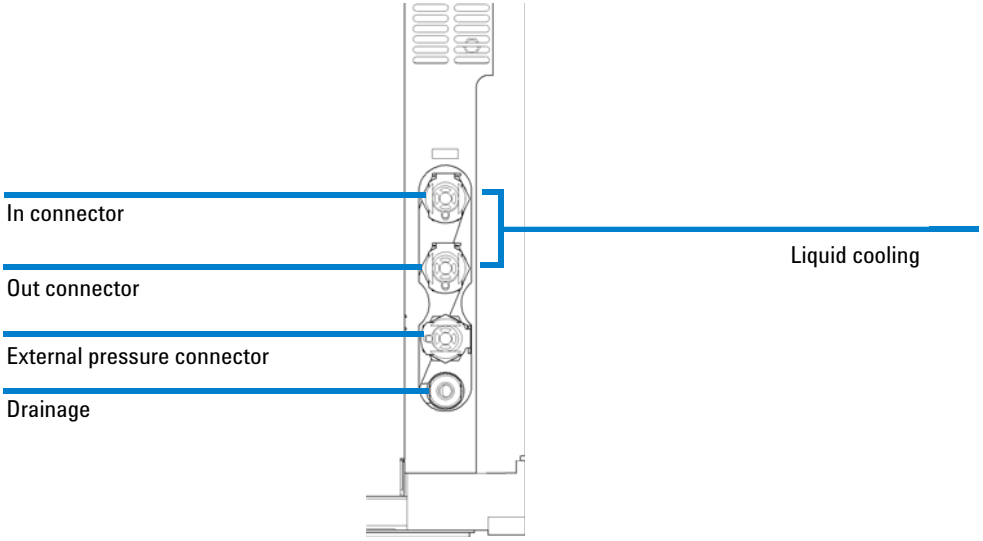


Figure 35 External high pressure gas inlet

Outlet Lift Connection to the Tubing System

The outlet lift is not connected to the tubing and valve system of the instrument by default. Please connect the respective PTFE tube provided in your accessories kit. The tube is labeled with an "8" and has one open end and one fitting.

To check whether this tubing is already installed, you should load a vial in the outlet lifter from the CE diagram and locate the tube coming from the outlet lift. Figure 36 shows an outlet lift with mounted tubing.

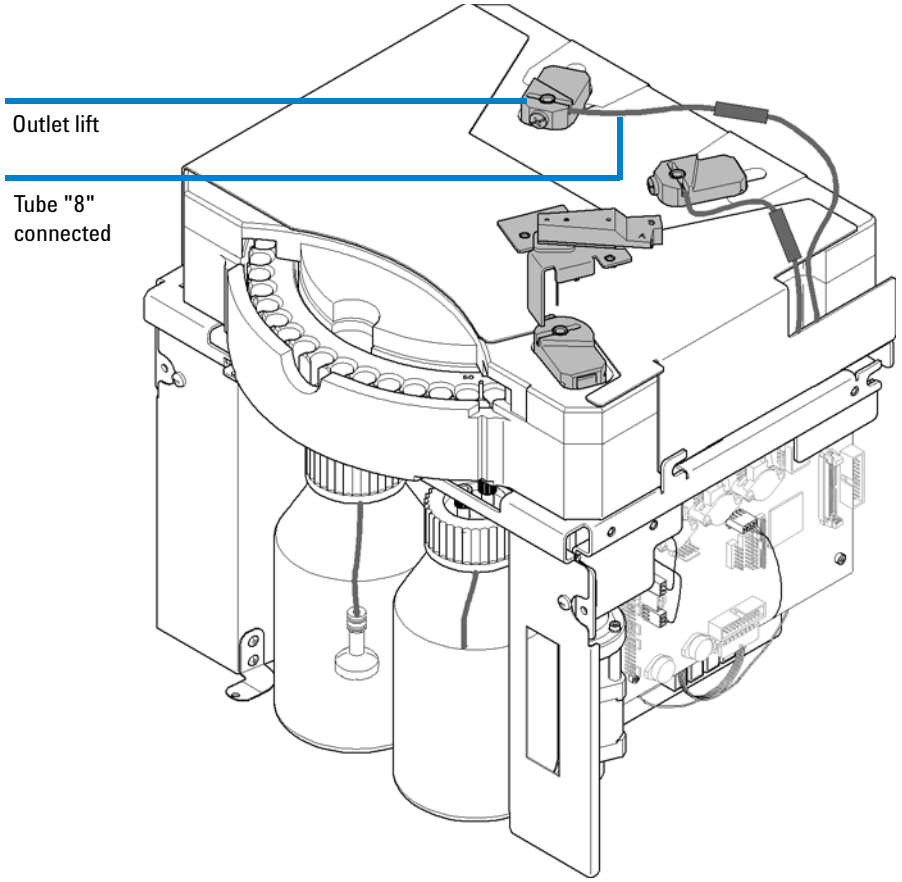


Figure 36 Outlet lift with mounted tubing for high pressure application

WARNING

Damage or contamination of pressure valves.

Make sure tube "8" is connected properly before you apply high pressure to any lift.

High pressure may flush liquid into the pressure valves and lead to permanent damage.

- Connect tube "8" prior to using high pressure.

Steps to Install the Outlet Lift Connection to the Tubing

Please refer to the section "Cleaning the Electrodes, Pre-punchers and Insulation Plate" on page 196 for more details on individual steps of the following procedure.

1. Unload all lifter positions.
2. Switch off the instrument.
3. Disconnect the power.
4. Open the front cover by releasing two screws and pulling it towards you.
5. Loose two screws to release the liquid handling module.
6. Pull the liquid handling module towards you.
7. Remove the plastic screw of the outlet lifter (left).
8. Extract the pre-puncher from the lift head by moving it straight up with tweezers.

WARNING

Injury by sharp metal edges

Pre-punchers are sharp and might result in injury.

To prevent personal injury, be careful when getting in contact with sharp metal areas.

9. Slide the open end of the teflon tubing over the outlet pre-puncher using forceps or by grabbing it with sandpaper wrapped around it.
10. Insert the outlet pre-puncher in the lift head in a vertical movement.
11. Tighten the plastic screw.
12. Slide the liquid handling module back into the instrument until it is positioned by internal pins.
13. Tighten the two screws fto fix the liquid handling module.
14. Mount the front cover and tighten the two screws to fix.

Preparing the Agilent CE Instrument for High Pressure Use

1. Ensure that the gas source is switched off prior to connection.
2. Connect the push-fit connector and gas line to the receptor on the rear of the Agilent CE instrument.
3. Connect the gas line to the source.
4. Switch on the gas supply.
5. Select under **Instrument** in the CE diagram the **Instrument Configuration** Menu, see Figure 37.

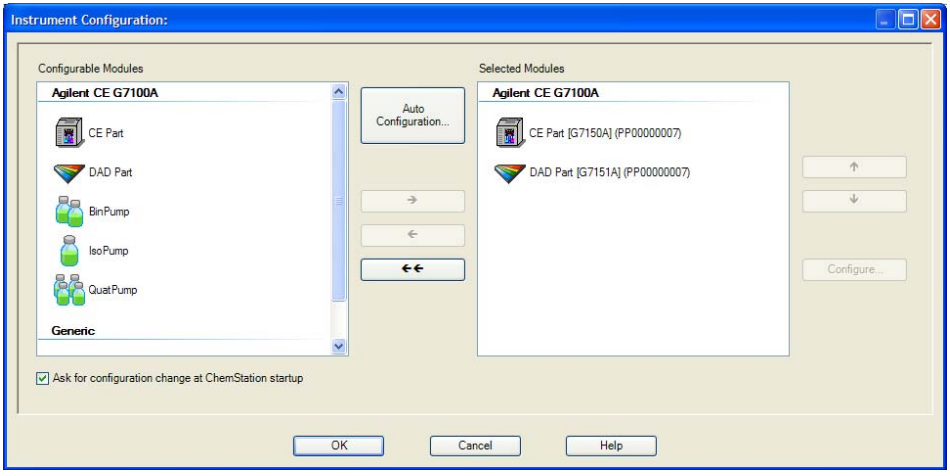


Figure 37 Configuration menu

6 Enable CE+p mode by selecting the option **External Pressure Installed**.

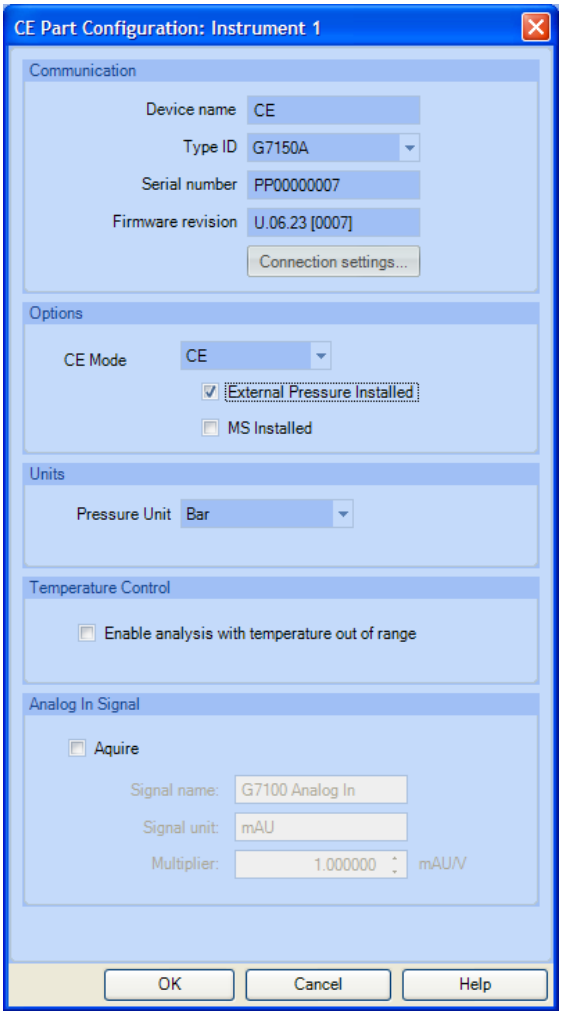


Figure 38 Select CE mode

7 Confirm your selection by clicking **OK**.

8 Make sure tube “8” is connected, see “Outlet Lift Connection to the Tubing System” on page 138.

9 Close and restart ChemStation to fully apply the changes.

10 The activated CE+p mode is displayed in the top line of the CE diagram and a new icon for an external pressure reservoir will appear, see Figure 39.

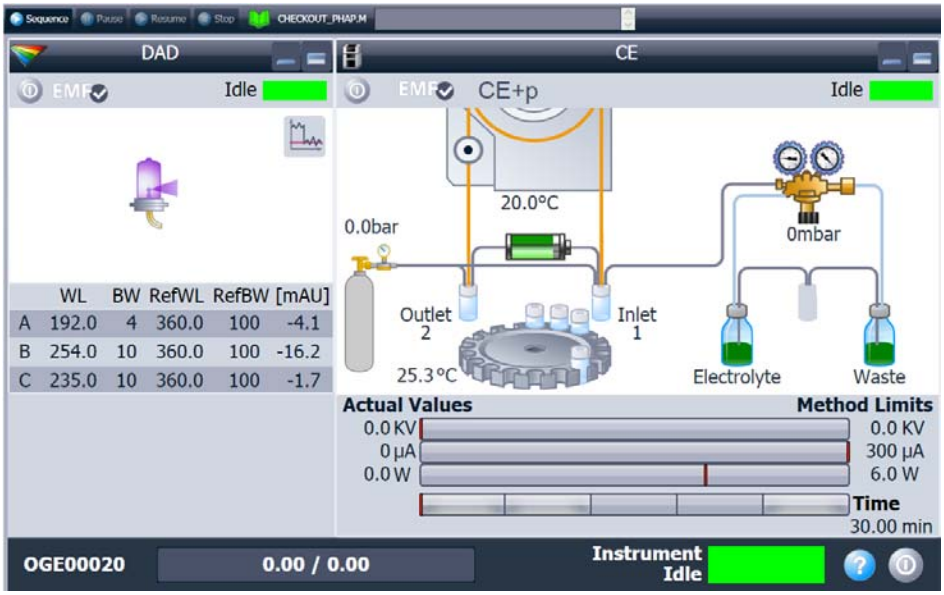


Figure 39 CE diagram with CE+p mode activated

Operation and Function in CE+p Mode

By selecting CE+p mode, some additional functions are available for control via the CE diagram, which will assist in the operation of capillary gel electrophoresis (CGE) with highly viscous buffers. This includes the ability to apply high pressure during preconditioning and postconditioning and the ability to use high pressure to introduce gel or samples to the capillary.

Preconditioning and Postconditioning

When the instrument is operating in CE+p mode, the user can chose to use the **High Pressure Flush** command menu during preconditioning or postconditioning (Figure 41). This means that high pressure will be applied to the capillary inlet vial which may be:

- A set value (2-12 bar)
- Raw external pressure (up to 15 bar): Allows pressurizing the inlet vial and/or the outlet vial. The external pressure up to 15 bar can be applied directly without reduction.

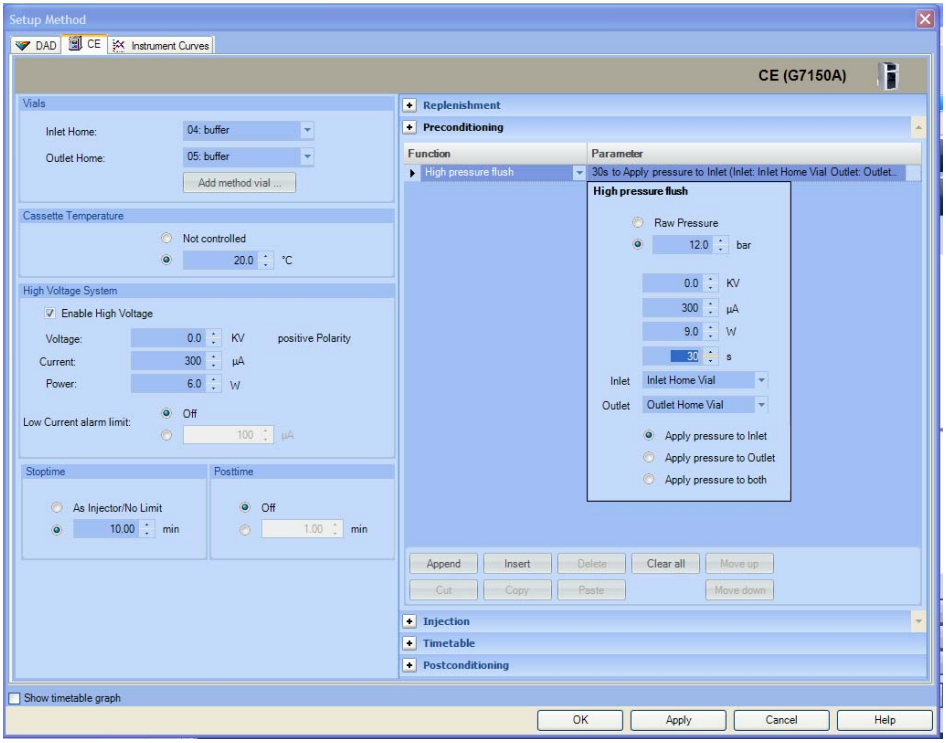


Figure 40 Method setup with CE+p mode activated

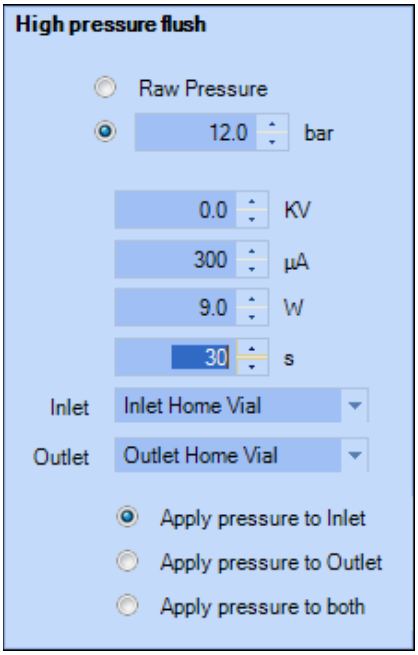


Figure 41 Parameters for high pressure flush

Other parameters which can be set in the **High pressure flush** command menu include:

- Applied voltage (kV), current (µA) or power (W)
- Duration (s),
- Inlet vial and/or outlet vial

Injection Options with CE+p

The installed high pressure supply may also be used for injection purposes using the **Timetable** option in the **Injection** field of a method setup.

From this menu you may select the **High pressure flush** command menu during injection with the same parameter choices that are available during Preconditioning.

This may be used to perform a pressure injection while using a capillary filled with replaceable gel.

NOTE Please note that the external pressure is not as precise as the injection pressure of up to 100 mbar!

Timetable Options with CE+p

The installed high pressure supply may also be used in the general timetable of a method setup. The **Pressure** command is extended by the **External** pressure functionality, see Figure 42 on page 146.

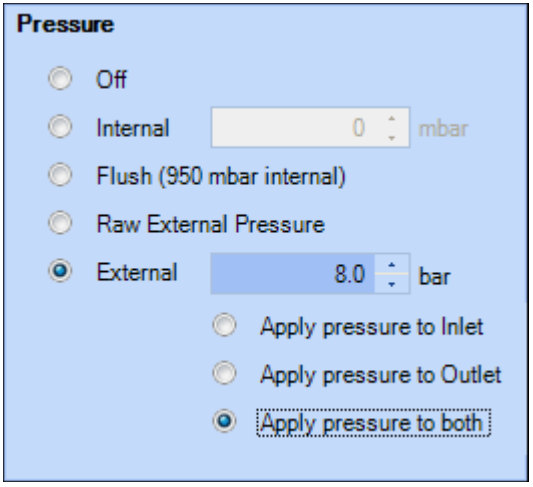


Figure 42 Pressure options in CE+p mode

Timetable controlled changes in the pressure settings are:

- OFF: Pressure usage is switched off.
- Internal, pressure (-100 mbar to +100 mbar): Can be applied to the inlet vial.
- Flush: Standard flush procedure is applied with an internally generated pressure of approximately 950 mbar.
- External: Allows pressurizing the inlet vial and/or the outlet vial. External pressure is reduced to the set value between 2 and 12 bar and applied in a controlled manner.
- Raw External Pressure: Allows pressurizing the inlet vial, and/or the outlet vial. The external pressure up to 15 bar can be applied directly without reduction.

CE+p Control Using the CE Diagram

High pressure may be applied independently of the method for capillary conditioning or cleaning by clicking the external pressure icon in the CE diagram (see Figure 39 on page 142). This will cause a parameter setting field to appear (see Figure 41 on page 145). From this field you may chose to apply pressure to the inlet, outlet or both vials, and also whether to simultaneously apply a voltage of -30 to 30 kV for a given time.

Capillary Electrochromatography, CEC

Capillary electrochromatography (CEC) is a fusion of capillary electrophoresis and capillary chromatography. In CEC, solvent is mobilized through a packed capillary column by electroosmotic flow instead of the hydraulic flow used in liquid chromatography LC. Higher efficiencies are achievable because of the uniform flow velocity profile and the ability to use smaller particle sizes in longer columns than is possible with LC. Operation of CEC requires an equal application of high pressure to the inlet and outlet vials in order to suppress bubble formation while avoiding hydrodynamic flow due to a pressure differential.

How to Use Your Agilent CE Instrument for Capillary Electrochromatography

Requirements

- External pressure supply (< 15 bar) of oil-free air or nitrogen.
- Push-fit connector and gas line (supplied in startup kit).
- Outlet lift connection to the tubing system

NOTE For external pressure supply, a male adapter fitting the instrument's female adapter and PTFE tubing (1/8" OD x 1/16" ID PTFE tubing) are part in the accessory kit of the instrument. Please add a suitable connector to the external pressure supply.

The inlet for the external high pressure gas is situated at the back of the instrument.

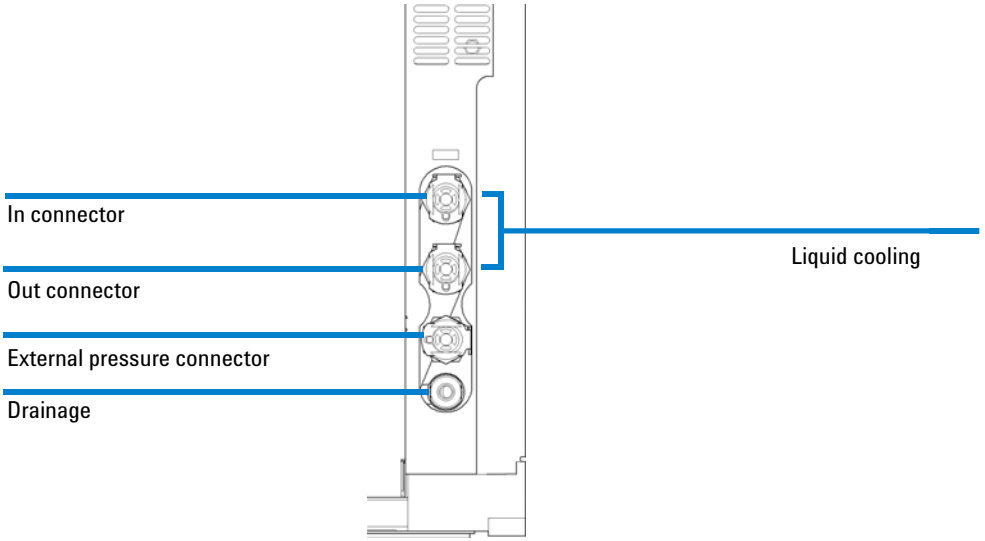


Figure 43 External high pressure gas inlet

Preparing the Agilent CE Instrument for High Pressure Use

1. Ensure that the gas source is switched off prior to connection.
2. Connect the push-fit connector and gas line to the receptor on the rear of the Agilent CE instrument.
3. Connect the gas line to the source.
4. Switch on the gas supply.
5. Select under **Instrument** in the CE diagram the **Instrument Configuration** Menu, see Figure 44.

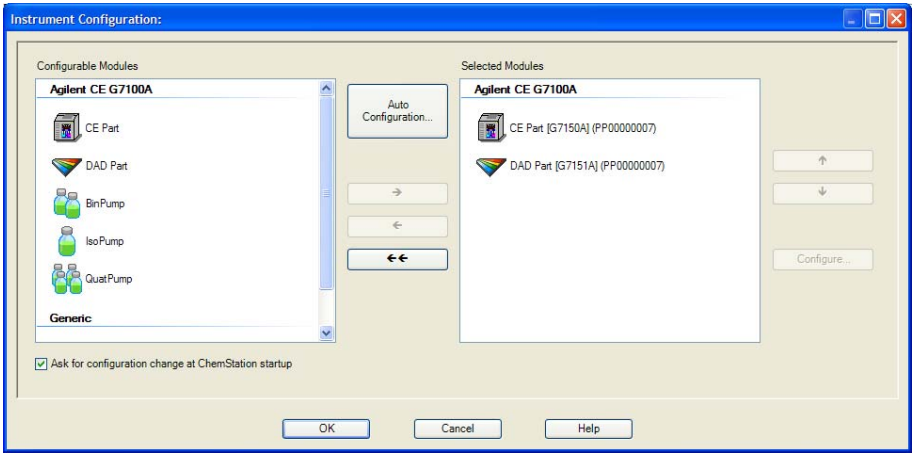


Figure 44 Configuration menu

6 Enable the CE+p mode by selecting the option **External Pressure Installed**.

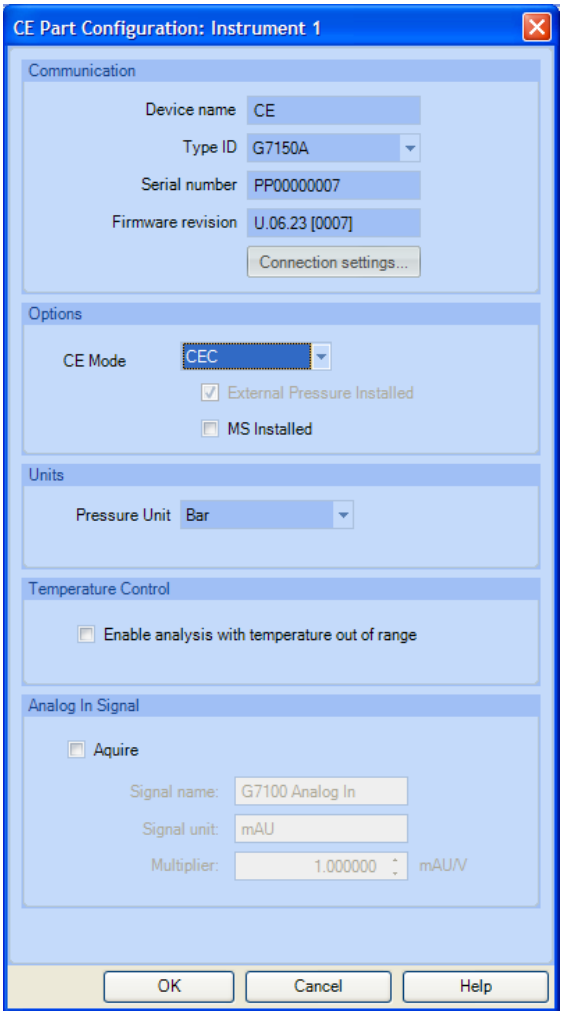


Figure 45 Select CE mode (to decide which access to config is used)

7 Confirm your selection by clicking **OK**.

8 Make sure tube "8" is connected, see "Outlet Lift Connection to the Tubing System" on page 138.

WARNING

Damage or contamination of pressure valves.

Make sure tube "8" is connected properly before you apply high pressure to any lift.

High pressure may flush liquid into the pressure valves and lead to permanent damage.

- Connect tube "8" prior to using high pressure.

---

9 Close and restart ChemStation to fully apply the changes.

10 The activated CE+p mode is displayed in the top line of the CE diagram and a new icon for an external pressure reservoir will appear, see Figure 46.

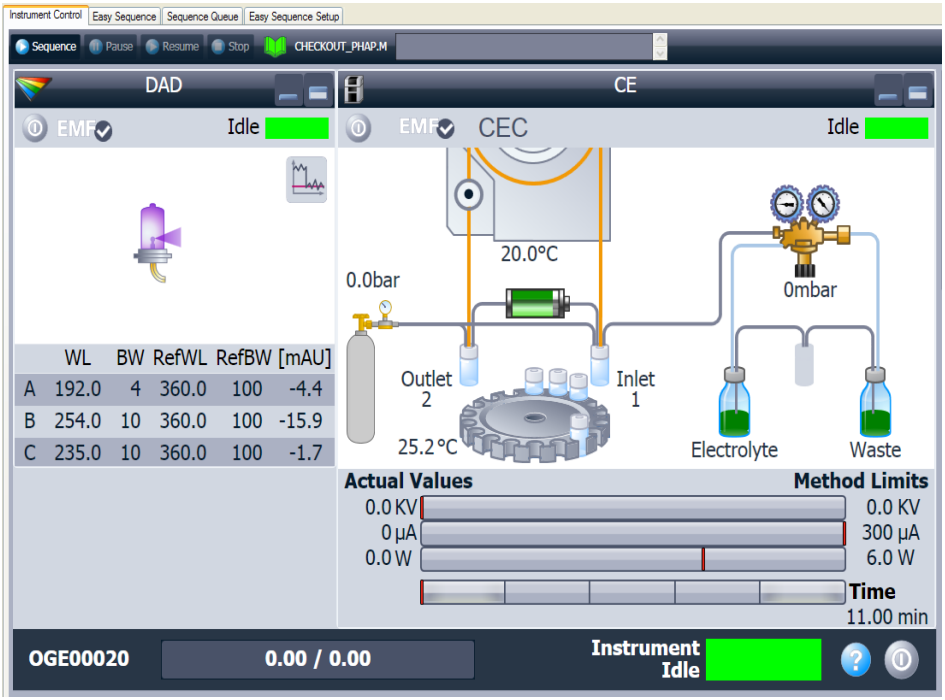


Figure 46 CE diagram with CEC mode activated

CEC-Specific GUI Explanation

When the **CEC mode** is selected, a new icon in the form of a gas bottle appears on the left right side of the CE diagram next to the tray (see Figure 46 on page 152).

There are also a number of new parameters which may be set either from the **Edit Entire Method** option or from the **Individual Parameter Settings** within the **Instrument** menu selected from the **Method & Run Control** toolbar. The new parameter choices appear in the following menu selections.

CEC Method Setup

When **CEC mode** is selected, a new section for pressure settings appears on the left side of the **Method Setup** dialog box. (see Figure 47 on page 154). The parameter set here is the pressure applied to both vials in the inlet and outlet lift during the electrophoretic run.

Options that can be selected include:

- Pressure off
- Internal, pressure or vacuum up to 100 mbar can be applied to the inlet lift
- Raw External Pressure
- External, set pressure from 2-12 bar

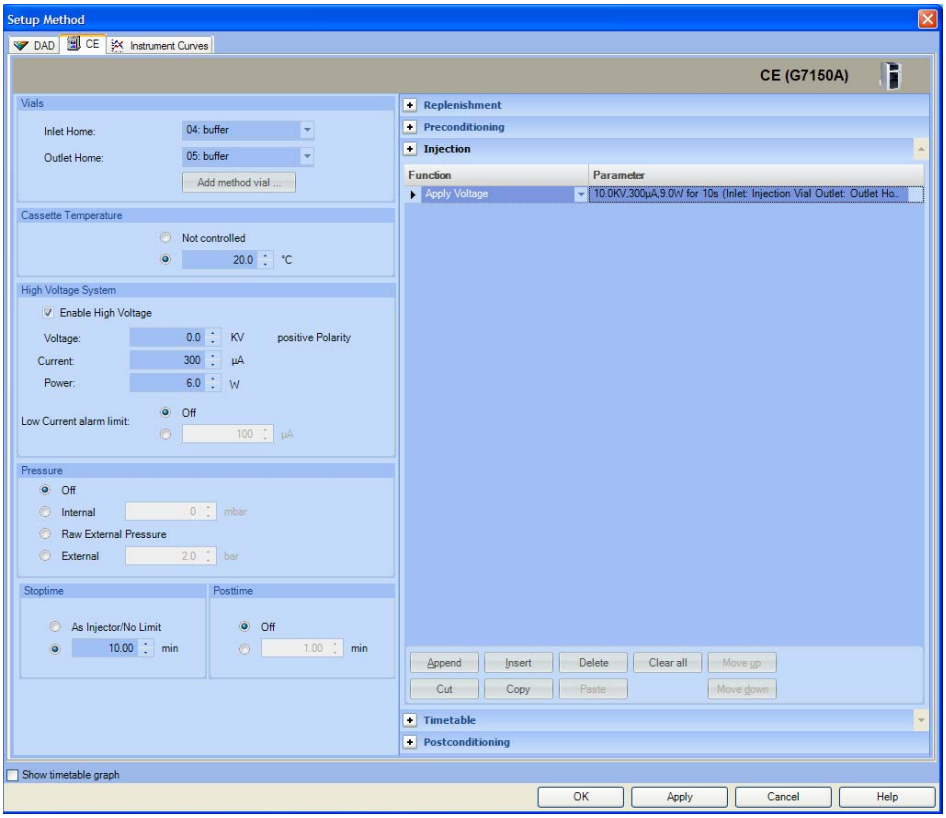


Figure 47 CEC setup method screen

Preconditioning and Postconditioning

In order to condition a packed capillary, an applied pressure of approximately 12 bar alone is usually insufficient to move the mobile phase rapidly through the column. Therefore, the applied high pressure may be assisted by the application of an electric field. This augments the high pressure flow with an electroosmotic flow. In the preconditioning or postconditioning section of the set-up method, the **High pressure flush** command can be used for this purpose, see Figure 48 on page 155.

High pressure can be applied to the capillary inlet vial which may be:

- A set value (2-12 bar)
- Raw external pressure (up to 15 bar): Allows pressurizing the inlet vial and/or the outlet vial. The external pressure up to 15 bar can be applied directly without reduction.

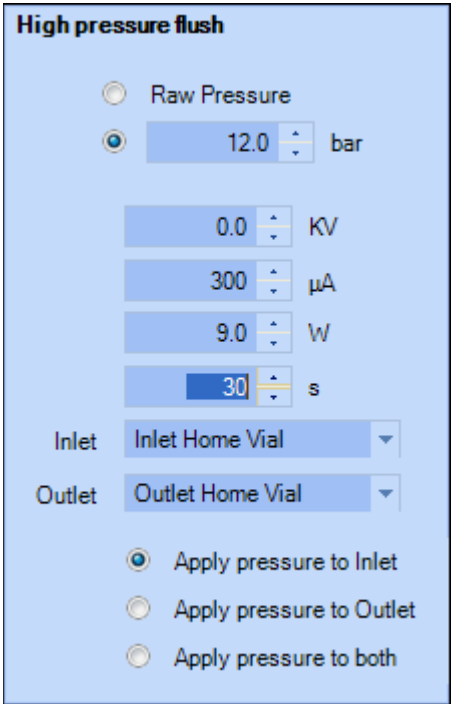


Figure 48 High pressure flush command menu

Other parameters which can be set in the **High pressure flush** command menu include:

- Applied voltage (kV), current (uA) or power (W)
- Duration (s)
- Inlet vial and/or outlet vial

NOTE When applying voltage simultaneously, the inlet and oulet vials must contain electrolyte in order to maintain electrical contact.

Injection Options with CEC

The installed high pressure supply may also be used for injection purposes using the **Timetable** option in the **Injection** field of a method setup.

From this menu you may select the **High pressure flush** command during injection with the same parameter choices as those available during preconditioning.

This may be used to apply a pressure injection while using a replaceable gel-filled capillary.

NOTE Please note that the external pressure is not as precise as the 50 mbar injection pressure!

Timetable Options with CEC

The installed high pressure supply may also be used in the general timetable of a method setup. The **Pressure** command is extended by the **External** pressure functionality, see Figure 49 on page 157.

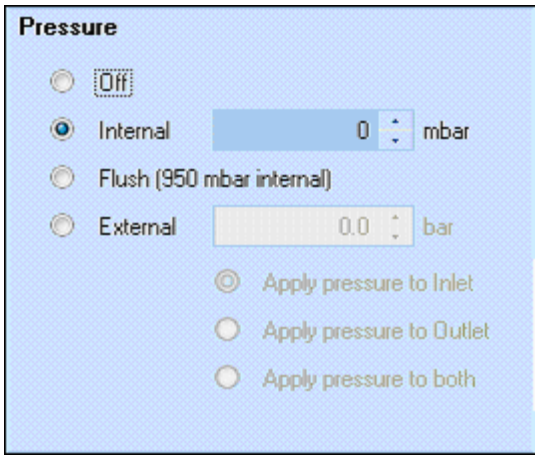


Figure 49 Pressure options in CEC mode

Timetable-controlled changes in the pressure settings are:

- OFF: Pressure usage is switched off.
- Internal, pressure (-100 mbar to +100 mbar): Can be applied to the inlet vial.
- Flush: Standard flush procedure is applied with an internally generated pressure of approximately 950 mbar.
- External: Allows pressurizing the inlet vial and/or the outlet vial. External pressure is reduced to the set value between 2 and 12 bar and applied in a controlled manner.

CEC Control Using the CE Diagram

High pressure may be applied independently of the method for capillary conditioning or cleaning by clicking the external pressure icon in the CE diagram (see Figure 46 on page 152). This will cause a parameter setting field to appear (see Figure 47 on page 154). From this field you may chose to apply pressure to the inlet, outlet or both vials, and also whether to simultaneously apply a voltage of -30 to 30 kV for a given time.

Running the CEC Analysis

After setting up the operational parameters, you can initiate the run from the **Method & Run Control** menu by clicking **Run Method** or by clicking **Start** in the CE diagram. Some other operational aspects should be noted when running CEC separations.

Capillaries Packed capillaries are very fragile and must be handled with great care. Offline purging of the capillary using an LC pump may be necessary if air bubbles form within the capillary.

Buffers CEC buffers generally have lower concentrations (4–20 mM) than conventional CE buffers. These may also contain a larger proportion of organic modifier than is found in CZE or MECC buffers. The currents generated are generally on the order of 2–10 µA for an applied field of approximately 600 V/cm.

Injection Because of the resistance of the packed bed, the usual applied pressure of up to 50 mbar is insufficient to introduce sample onto the capillary. In this case, high pressure and/or electrokinetic loading may be used, although the limitations of this technique should be noted.

Problem Solving

Offline purging If air bubbles occur during an analysis, the current will become instable or very low (< 0.3 µA). If this occurs, remove the packed capillary and connect it to an LC pump capable of delivering a flow rate of 40 µL/min to the capillary.

NOTE Great care should be taken when removing and handling the capillary and when connecting and disconnecting the capillary to or from the pump. Fused silica packed capillaries are extremely fragile.

Instrument purging If the capillary is filled with solvent, then this may be replaced by inserting the capillary into the instrument and flushing with external pressure using the external gas supply icon on the CE diagram. Generally, 10–60 minutes are sufficient to replace the storage solvent with the operating mobile phase, depending on the velocity of EOF.

6
Troubleshooting and Diagnostics

CE Problem Solving 162
Agilent Lab Advisor Software 169

This chapter gives an overview of troubleshooting and diagnostic features and the different user interfaces.

CE Problem Solving

The problem solving section in the instrument online help assists you in solving the most common failures. Nevertheless, a short list of problems are featured here.

Power On Fail

The instrument will boot up after turning the instrument on by pressing the power on switch. A green LED in the power switch is illuminated. If the instrument power on fails, the green control LED in the power switch may not light up.

- Check the external power supply, power cords and plugs for proper connection.
- Check the line fuses next to the power plug on the right rear of the instrument.
- Check fuses 1 to 6 on the main electronic board. A blown fuse is indicated by a small red LED visible through a hole in the metal shield of the instrument.

Leaks

The leak sensor in the Agilent CE instrument is located in the lower right part of the instrument, see Figure 50.

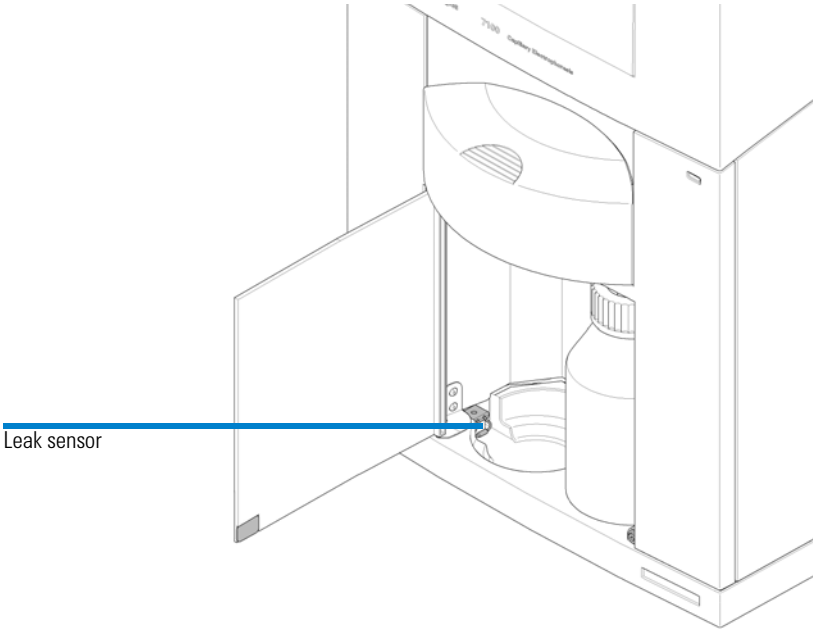


Figure 50 Leak sensor position

When the leak sensor is activated:

- The error LED on the front of the instrument is illuminated.
- The CE status displays an error.
- A logbook entry is created.
- The run is stopped.
- Pressure is released.
- High voltage application is stopped.

If the leak sensor is activated or you think there is a leak in the instrument:

1 Immediately switch off the Agilent CE instrument (and the external water bath, if connected).

2 Disconnect the line power cord.

3 Open the lid.

4 Remove the front cover as described to diagnose the cause of leak.

5 Dry the leak sensor using a tissue.

NOTE The error will stay active for the ChemStation or Lab Advisor even after corrective action and drying. Please acknowledge the error by clicking "Clear error" in the Lab Advisor or switching the power knob in the top right corner of the CE diagram of the ChemStation.

Possible Reasons for Leaks and Appropriate Action for Spilled Liquid from Other Sources

- If you have spilled some liquid into the Agilent CE instrument, it is sufficient to thoroughly clean and dry the Agilent CE instrument and the leak sensor.

Leaking Water Bath Tubing Inside the Agilent CE Instrument

- Call Agilent Technologies.
- Do not use the Agilent CE instrument until Agilent Technologies has repaired it.

Leaks in Replenishment Tubing or Valves

- Call Agilent Technologies.

Reason Unknown

- If you can not trace the reason for the leak, call Agilent Technologies. There may be an instrument problem.

Blocked Replenishment Needle

If you are using the replenishment function of the Agilent CE instrument, buffer may precipitate inside the replenishment needle. To avoid this, put a vial filled with water or buffer (to a height of 1.8 cm) in vial position 49. Vial position 49 is the home position of the replenishment lift. The vial will be picked up by the lift and brought to the replenishment needle. The needle will dip into the water, thus preventing the buffer from precipitating. (see "Preparing Vials for Buffer and Sample" on page 115, Vial position 49)

Leakage Current

Leakage current is indicated by a yellow bar in the current part of the energy status display in the CE diagram. Only high leakage current will lead to this. An instrument curve allows you to monitor current leakage even at low values from the ChemStation.

Leakage current means that the current at the inlet electrode is different from the one at the outlet electrode and thus a current flows outside the capillary. A certain leakage current must be regarded as acceptable, since it is not avoidable due to technical reasons.

It can be caused by:

- A broken capillary
- An empty inject vial
- An air bubble in injection vial/or run buffer vials
- An air bubble in capillary
- A contaminated insulation plate
- A high humidity level
- A conductive capillary surface

If you find a broken capillary in the alignment interface, use an ultrasonic bath to clean the interface and remove quartz residues.

Broken Capillary

To check for a broken capillary, remove the capillary cassette and open it as described under "Removing the Capillary Cassette from the Agilent CE Instrument" on page 121. The capillary is especially sensitive to breaking at the detection window and the capillary ends, therefore check these parts of the capillary. If the capillary is broken at the detection window, a leakage current of nearly the same value as the expected current may occur.

Small instabilities in the current curves, as shown in Figure 51, may also be a sign of a broken capillary.

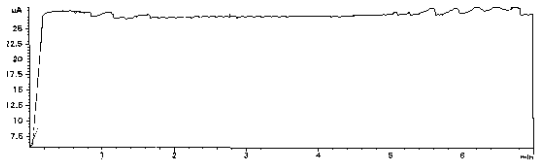


Figure 51 Current instabilities

If the capillary is broken at the ends, it may no longer reach into the liquid in the vial. In that case, the analysis is stopped if the low current alarm limit has been reached (this must be set first). Sometimes the capillary has very small cracks which are hardly recognizable under a microscope.

- Exchange the broken capillary

Contaminated Insulation Plate

Salt crystals or other contamination of the insulation plate may cause leakage current.

- Clean the insulation plate as described in "Cleaning the Insulation Plate" on page 207.

Empty Injection Vial

Access the vial position specified in the **Sample info** or the **Sequence table** using the **Get vial** function in the **Tray control** screen.

- Check if the vial is filled.

Dirt in the Vials

Clean all vials prior to use. First, flush them with water followed by, for example, some isopropanol.

- Use compressed air to dry the vials inside.

Air Bubble in Injection Vial or Run Buffer Vials

When filling sample or buffers into the vial, an air bubble is sometimes formed. This happens very frequently when using microvials. Air bubbles can cause air to be injected instead of the sample.

- To avoid air bubbles, carefully fill vials starting from the bottom.
- If you cannot avoid the formation of air bubbles, adjust the lift offset in the **Home values** dialog box so that the capillary doesn't reach into the bubbles.

Air Bubble in Capillary

Small air bubbles in the capillary may cause spikes in your electropherogram. Larger air bubbles expand so much during analysis that the current drops below the lower alarm limit.

- Flush your capillary with buffer to remove air bubbles.

Problems with the Replenishment System and Buffers Containing SDS

When a vial is replenished the SDS foam may stick to the side of the vial. The empty function draws air around the foam into the replenishment needle. When filling this vial, a set of new foam bubbles is introduced into the vial before the fresh buffer. The surface sensing system recognizes the first foam bubble as liquid. So the final liquid level is not at the height it should be. It may also happen that the vial contains no buffer liquid but only foam. The result could be seen as low current or even no current supplied.

As a workaround we recommend programming a replenishment program in two steps.

1 Replenish to a level about 0.2 cm higher than required.

2 Fill to the desired level.

If the fill results a level higher than the desired one, the vial is emptied to the level without using the sensing function and the foam has no influence.

As an example: the desired height is 1.4 cm

1 Replenish vial XX to 1.6 cm (0.2 cm more)

2 Fill vial XX to 1.4 cm

Alternative: No Replenishment Necessary.

1 Fill several vials with buffer.

2 Program methods which use these vials as the inhome and outhome vials (for example vials 4, 5, 6, 7).

   Method 1:

   inhome = 4, outhome = 5

   Method 2:

   inhome = 6, outhome = 7

Agilent Lab Advisor Software

The Agilent Lab Advisor software is a stand alone product that can be used independently of a data system. Agilent Lab Advisor software helps to manage the lab for high quality electrophoresis and chromatographic results and can monitor in real time a single Agilent CE or all the Agilent GCs and LCs configured on the lab intranet.

Agilent Lab Advisor software provides diagnostic capabilities for all Agilent 7100 CE instruments. This includes diagnostic capabilities, calibration procedures and maintenance routines for all the maintenance routines.

The Agilent Lab Advisor software also allows users to monitor the status of their CE instruments. The Early Maintenance Feedback (EMF) feature helps to carry out preventive maintenance. In addition, users can generate a status report for each individual CE instrument. The tests and diagnostic features provided by the Agilent Lab Advisor software may differ from the descriptions in this manual. For details, refer to the Agilent Lab Advisor software help files.

Configuration

The Lab Advisor software can communicate with a 7100 CE instrument via LAN or by a serial connection (RS232 cable, null-modem). To configure a connection, go to the section Configuration in the Lab Advisor software. Select **Instrument > Available Instruments** and as the instrument type **Agilent CE**. You can enter either the LAN address (for example 192.168.254.11) or the respective COM port of your PC (for example Com1) under instrument address.

7
Hardware Information

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This chapter provides a more detailed description of the instrument's hardware and electronics.

Identifying Instrument Components

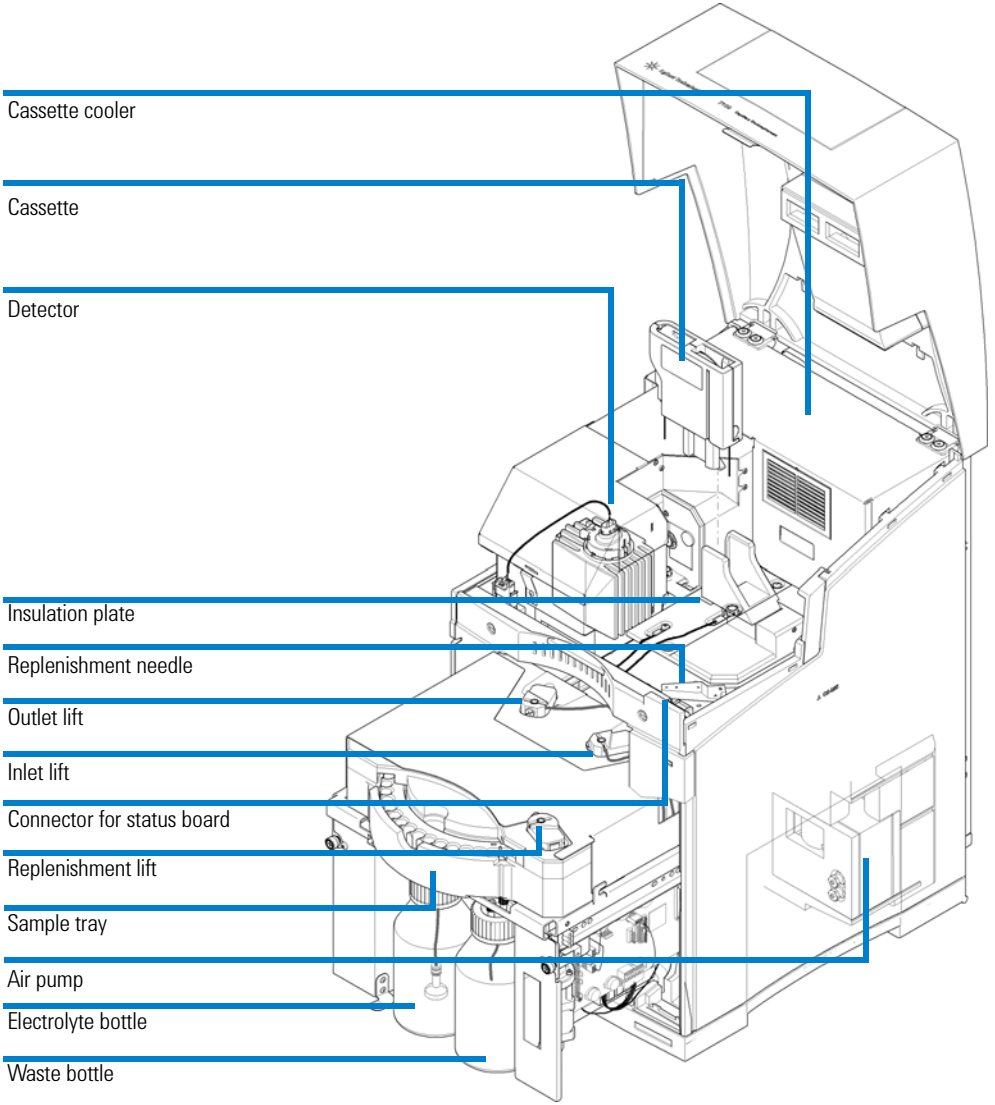

Figure 52 Overview of instrument components

7100 Capillary Electrophoresis Instrument Electronics

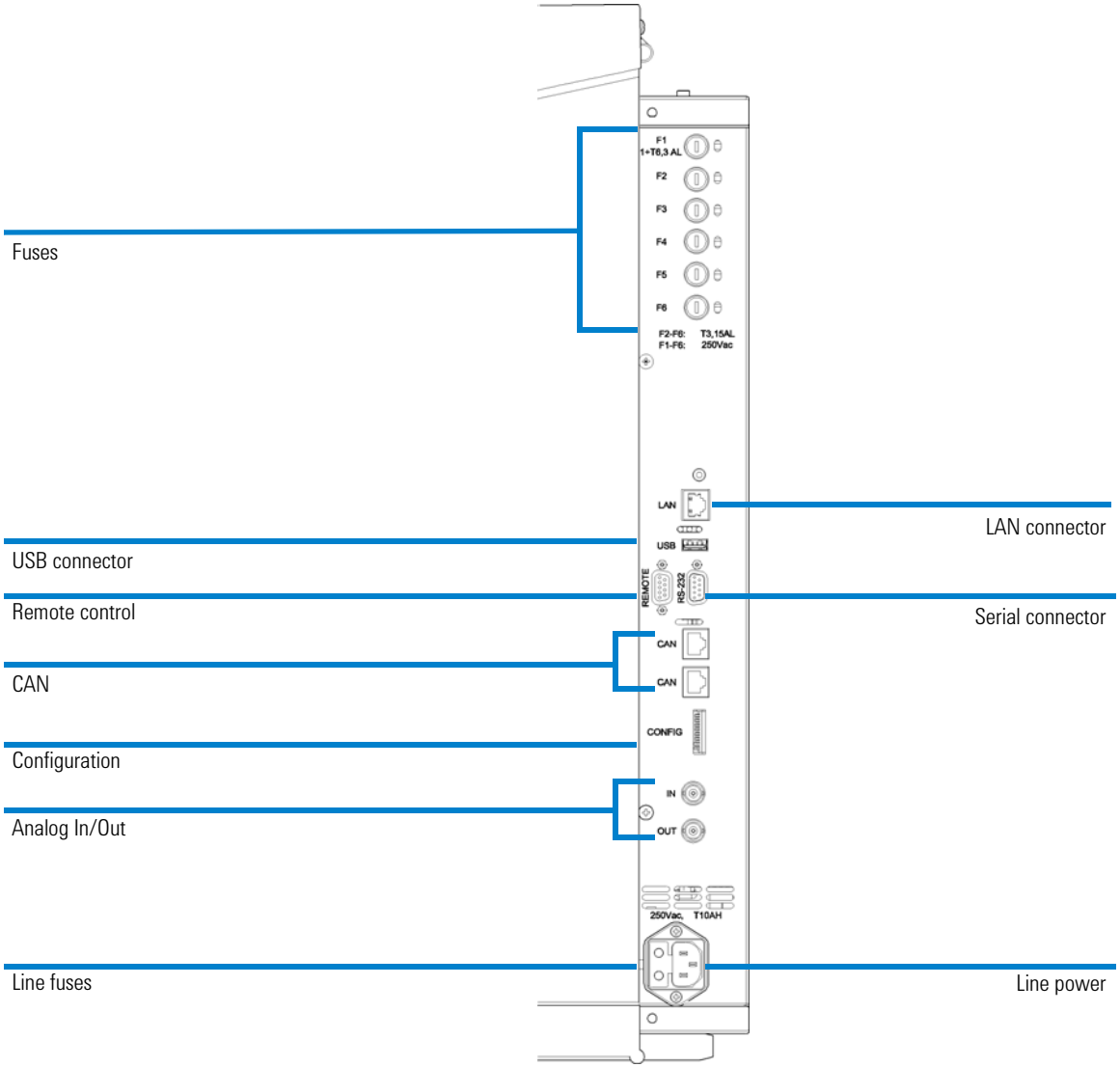

Figure 53 Connectors on the rear of the instrument

All electrical connectors are placed on the right side of the instrument, see Figure 53 on page 173.

Available Connectors:

- Power connector, Fuse netfilter: 2 fuses, 250 VAC, T6.3AH, (**part number 2110-1018**)
- LAN connector (7100 to controlling PC)
- CAN connectors (7100 to additional Agilent 1200 Series Module)
- USB connector (for future use)
- RS232 connector (serial interface to a computer. This connection has a special out pin and is not compatible for connecting printers or plotters. It is called "null modem cable" with full handshaking and the wiring is established between pins 1-1, 2-3, 3-2,4-6, 5-5, 6-4, 7-8, 8-7 and 9-9.)
- APG remote connector (Agilent Technologies Analytical Products Group remote connector to be connected to Agilent modules, for example to MS system)
- Analog out (BNC connector, 0 to 0.1 V or 0 to 1 V)
- Analog in (BNC connector, 0 to 1 V, shield is analog - and center is analog +)
- 8-bit configuration switch (see Chapter 4, “LAN Configuration,” starting on page 61

Fuses

- Fuse 1 (Peltier) T6.3AL, 250 VAC, (**part number 2110-0623**)
- Fuse 2 (HV supply, CE detector board) T3.15 AL, 250 VAC, (**part number 2110-1417**)
- Fuse 3 (CE sampler board with valve and lifter control) T3.15 AL, 250 VAC, (**part number 2110-1417**)
- Fuse 4 (heater, optional), T3.15 AL, 250 VAC, (**part number 2110-1417**)
- Fuse 5 (processor, +5 V, +15 V, -15 V supplies on mainboard, air pump, fans, CE temperature sensor board and cassette fan) T3.15 AL, 250 VAC, (**part number 2110-1417**)
- Fuse 6 (DAD) T3.15 AL, 250 VAC, (**part number 2110-1417**)

NOTE

Next to each fuse F1 to F6 is a LED on the rear of the electronic board. This is visible through a cutout in the metal shield of the electronic box. A red LED indicates that the respective fuse is blown.
If one of the fuses is blown, the green LED of the power switch flashes.

WARNING

Fire hazard

Using wrong fuses may result in a fire hazard.

- For continued protection against fire hazards, only replace fuses with the same type and rating.
- Only use the fuses specified for this instrument. Use of other fuses or materials is prohibited.

Firmware

The firmware for the instrument consists of two independent sections:

- A non-instrument-specific section, called the resident system.
- An instrument-specific section, called the main system.

Resident System

The resident section of the firmware is identical in many Agilent devices and modules. Its properties include:

- The complete communication capabilities (CAN, USB, LAN and RS-232C)
- Memory management
- Ability to update the firmware of the main system

Main System

Its properties include:

- The complete communication capabilities (CAN, USB, LAN and RS-232C)
- Memory management
- Ability to update the firmware of the resident system

In addition, the main system comprises the instrument functions that are divided into:

- Common functions:
  - Run synchronization through APG remote
  - Error handling,
  - Diagnostic functions
- Or module-specific functions:
  - Internal events such as lamp control, filter movements
  - Raw data collection and conversion to absorbance

Firmware Updates

Firmware updates can be done using the Lab Advisor Software, PC and Firmware Update Tool with local files on the hard disk.

To replace or update the firmware:

1. Connect to the instrument with Lab Advisor and refer to the section **Firmware Update**.
2. Provide the firmware file on your local hard disk. You might locate the file in any folder and provide the location by selecting **browse to folder** or put it to a folder specific for your instrument (CE/LC).
3. Connect to the instrument, select the file in a standard folder or browse to the respective folder. Download it to the instrument.

NOTE While the firmware is downloaded to the instrument, the status indicator LED on the front of the instrument front will blink in red.

4. Disconnect the firmware update tool from the instrument.

   You can find a detailed description in respective help files of the Lab Advisor.

The file naming conventions are:

PPPP_RVVV_XX.dlb (for example **7101A_U.06.23_0002.dlb**).

PPPP represents the product number, R the firmware revision, VVV is the revision number and XX is the build number of the firmware.

NOTE Updates to main system can only be done in the resident system. Updates to the resident system can only be done in the main system.

Main and resident firmware must have the same version.

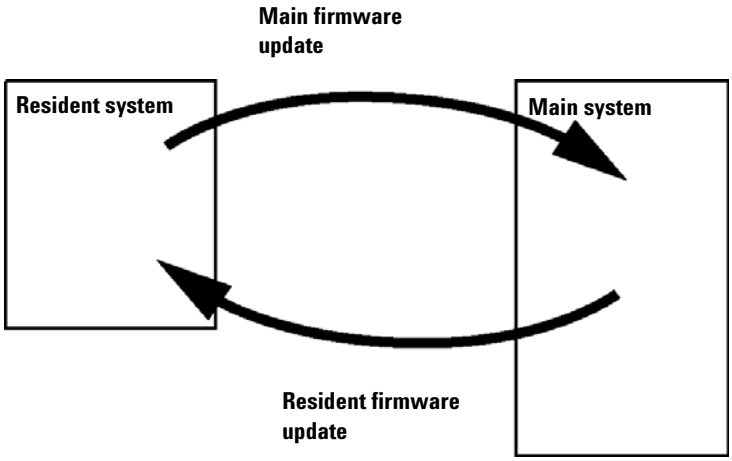

Figure 54 Firmware update mechanism

The latest firmware revisions and documentation are available on the Agilent website (http://www.chem.agilent.com)

Diode Array Detector

You can control external devices as part of the method through the relay contact connectors on the rear of your instrument.

The DAD is directly controlled by the DAD diagram, through method parameters and general control settings.

Direct control of the DAD and control through method parameter is described in Controlling the Agilent CE instrument (“Detector Parameters” on page 107) and the section “User interface” in the ChemStation online help.

DAD Control

In the **Method and Run Control** of the ChemStation select **Instrument > More DAD / Control... > Control** to open the DAD control dialog (Figure 55 on page 180).

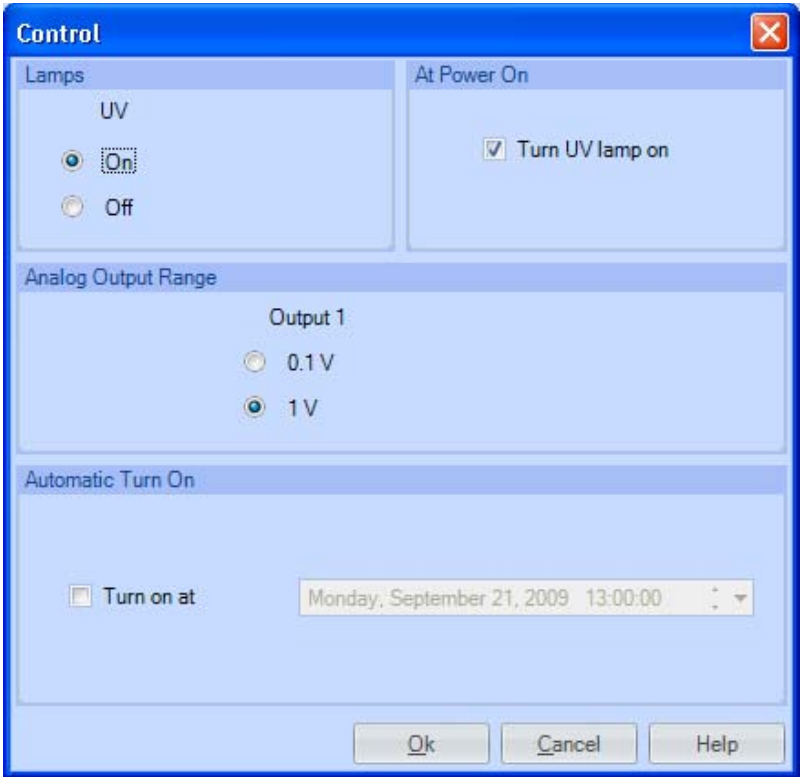

Figure 55 DAD control dialog

You may switch the UV lamp on or off in the **Lamps** dialog. Changes are applied only after clicking **OK**. A checkmark in the section **At Power On** allows you to immediately turn on the deuterium lamp when the instrument is switched on.

In the **Automatic Turn On** field you can also set a date and time when the lamps are switched on automatically. The instrument must be kept powered on, for example overnight, to use this feature.

Digital to Analog Converter

The 7100 CE System provides a direct analog output of chromatographic signals A. It may be used to connect to another data acquisition system or chart recorders. The analog signal is converted from digital format by the on-board 20-bit digital-analog-converter (DAC). Please select the suitable voltage range for your analog recording hardware under **Analog Output Range**.

Changing the Fuses for the Power Supplies

Prior to changing fuses, you must switch the instrument off and disconnect it from the line power.

Fuses are located on the back right side of the instrument. Replace fuses with identical part numbers as specified under "7100 Capillary Electrophoresis Instrument Electronics" on page 173.

WARNING

Fire hazard

Using wrong fuses can result in fire hazard.

- For continued protection against fire hazard, replace fuses only with the same type and ratings.
- Only use the fuses specified for this instrument. The use of other fuses or materials is prohibited.

Installing Drainage Tubing

The tubing drains condensation out of the instrument which may appear if you connect an external water bath to cool your samples in the sample tray.

On the left rear side of your instrument you may install silicone tubing. Place a beaker of at least 200 mL capacity under this tubing to collect the drained condensation.

External Water Bath for Tray Cooling (Optional)

The two connections on the left rear of the instrument (see Figure 2 on page 59) can be used to install an external water bath for the tray of the Agilent CE instrument.

The temperature for the cooling liquid is set at the external water bath. The temperature display in the CE diagram displays the actual temperature of the tray controlled by the cooling liquid. The external water bath cannot be controlled by the Agilent CE instrument.

Good Practices

To avoid problems when using the external water bath, consider the following points.

- The tubes used should have thermal insulation to avoid condensation.
- Use a displacer to minimize the amount of liquid that is released in case of leaking cooling lines.
- The device should be equipped with a liquid level sensor to switch off automatically if liquid is lost.
- Do not operate the devices at temperatures below +1 °C to avoid formation of ice on internal surfaces.

External Water Bath Requirements

- Minimum cooling power 100 W, at bath temperatures of 5 °C.
- Temperature precision better than ± 0.2 °C.
- Safety requirements must meet national standards and also: be suitable for unattended operation, be suitable for continuous operation, and have controllable high temperature protection.
- Requirements for external liquid circulation:

  Suitable for external circulating of liquid,

  Suitable for connection of 8 mm ID tubes,

  Minimum circulating liquid flow rate 8 L/min,

Minimum differential pressure of 150 mbar, and

Maximum pressure of 500 mbar.

- Requirements for pressure pump:

  A pump with the capacity to generate a differential pressure of at least 0.15 bar. For a single action pump, a high pressure capability of 0.15 bar is required. The high pressure must not exceed 0.5 bar and the low pressure must not exceed -0.5 bar.

- Cooling liquid:

  Distilled water plus a maximum 3 % anti-freeze.

- Bath temperature:

  The minimum allowed temperature is 1 °C and the

  Maximum allowed temperature is 50 °C.

Connecting an External Water Bath

- The startup kit supplied with the Agilent CE instrument includes two fittings for flexible tubing with 8 mm internal diameter. Use those fittings for the flexible tubing used with your external water bath.
- Connect the fittings to the connectors on the instrument (see Figure 2 on page 59). Use the upper connector for incoming liquid, the lower connector for outgoing liquid.

NOTE Make sure both the water bath and the Agilent CE instrument are switched off when installing the external water bath.

CAUTION Risk of liquid spill and instrument damage

Higher pressure might lead to liquid leakage inside and outside the instrument. Elevated temperatures might lead to deformation and leakage of the tubing system. Liquid spillage can damage electronic components of the instrument.

- Do not use a water bath with more than 0.5 bar pressure.
- Do not use liquids at temperatures above 50 °C.

Analog to Digital Converter

Some detectors (for example CCD detectors) require an intermediate interface to convert analog data into a digital format that can be sent to the ChemStation (Analog In). The Agilent 7100 Capillary Electrophoresis System has a 20-bit AD converter built in. It enables voltage conversions ranging from 0 V to 1 V.

You can set up name, units and conversion factors for the analog in signal from the following dialog which is accessible under Instrument/configuration, CE-part configuration, see Figure 56.

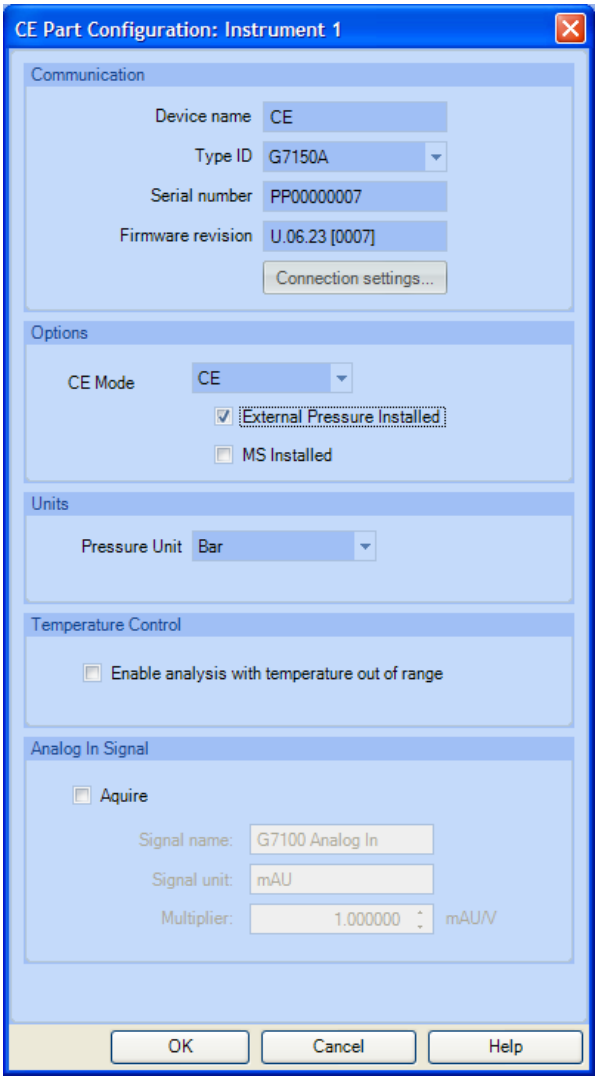

Figure 56 CE part configuration

8
Maintenance

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This chapter describes how to maintain the CE instrument.

Standard Operating Procedures for Maintenance of Your Agilent CE Instrument

This chapter describes standard operating procedures (SOPs) for regular maintenance of your instrument. Only perform maintenance on the Agilent CE instrument that is specified in this chapter. Other maintenance or repairs must be done by personnel trained by Agilent Technologies. Unauthorized maintenance may be dangerous and damages are not covered by warranty.

Maintenance tasks are supported by the Agilent Lab Advisor software or the Agilent Instrument Utilities software. It is delivered with the 7100 Agilent Lab Advisor software comes with a complete set of features. The Agilent Instrument Utilities software provides set of basic features.

These software packages assist you by providing hardware test suits, a set of tools used during procedures, Early Maintenance Feedback (EMF) parameters and scheduling functions. You can find a detailed description in the respective online help documentation.

Overview of Maintenance

Table 25 Overview of maintenance

Procedure	Typical frequency	Notes
Cleaning the electrodes, pre-punchers and insulation plate	Clean frequently*	• Inspect pre-punchers for salt deposits, bent tips, deposits in top funnel. Replace if either electrodes or pre-punchers are bent, show signs of wear such as scratches, or cannot be cleaned.
Cleaning the electrodes	Clean frequently*	Inspect for salt deposits, O-ring integrity, bending, and check alignment.
Cleaning the detection window and the alignment interface		Capillary window: • Gently clean with isopropanol and a lint-free cloth. Optical alignment interface: • Inspect for occlusion under microscope or magnifier (dust or shards of polyimide). • If capillary was broken while in the interface, inspect and remove fragments (ultrasonic device and air burst)
Preparing/cleaning the replenishment system	System cleaning should be performed when new buffer is added to the electrolyte reservoir.	Clean for storage with isopropanol/water. Filter all solutions prior to use (0.2 or 0.45 µm).
Maintaining the functionality		
Changing the air inlet filter		• if the environment is very dusty • if the system cannot generate enough pressure • at least every three months.
Changing the lamp	Perform lamp intensity test from the detector test suite in the Lab Advisor regularly (for example bi-weekly) and monitor lamp life using EMF values.	Use the red-labeled alignment interface without capillary for tests.

Table 25 Overview of maintenance

Procedure	Typical frequency	Notes
Repair of replenishment needle		• Use the **Clean Level Sensor** task to remove salt deposits inside the tubing system. • Keep a water-filled parking vial in carousel position 49. • Occasionally replace the parking vial in position 49 with water or buffer. • Inspect for bending if clogged. • Remove persistent clogging by a syringe flush with water/isopropanol or use ultrasonic device.
Buffer reservoir		• Inspect O-ring in cap for damage, remove salt deposits. • Do not use buffer reservoir for long-term storage (prevents oxygen saturation and bacteria from growing). • Remove liquid from waste bottle.
Inlet frit		• Inspect and clean (especially if absorbing buffers have been used). • Replace when dirty.
Vial caps		• Do not overuse vial caps (especially the PEO caps). • Inspect for damage.

* The chosen frequency may be time-based, for example weekly or injection-based, for example 100 injections. It depends on your individual application and needs. The time and injection-based EMF counter can be customized.

NOTE Do not open the top cover or remove the cartridge without lowering the lifts. Use the function maintenance position from the tools section of the Lab Advisor. Careless opening may lead to floating of electrodes with buffer or sample which leads to contamination or carry-over.

List of Standard Maintenance Procedures:

- Clean the electrodes
- Clean the replenishment needle
- Clean the pre-punchers
- Check alignment of electrodes
- Clean the replenishment tubing system
- Change the air inlet filter
- Change the buffer frit
- Change the UV lamp
- Clean the insulation plate
- Perform a (full) system diagnostic test

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components which are subject to wear or stress. Ideally, the frequency at which components are exchanged or cleaned should be based on the intensity of usage of the instrument and the analytical conditions, and not on a predefined time interval. The Early Maintenance Feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

The CE instrument provides EMF counters for the CE part and the detector. The counters increment with instrument use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. The counters can be reset to zero after the related parts are exchanged. The CE instrument provides the following EMF counters:

- Analysis start counter
- Accumulated air pump on time
- Accumulated UV lamp on time
- Number of ignitions

Using the EMF Counters

The user-settable EMF limits for the EMF counters enable the Early Maintenance Feedback to be adapted to specific user requirements. The useful lamp burn time is dependent on the requirements for the analysis (high or low sensitivity analysis, wavelength, etc.), therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

Setting the EMF Limits

The setting for the EMF limits must be optimized over one or two maintenance cycles. Initially, no EMF limit should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by the instrument counters. Enter these values (or values slightly less than the displayed values) as EMF limits and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.

NOTE Please introduce self-made EMF counters to remind you to frequently clean the electrodes, pre-punchers and insulation plate.

Cleaning the Electrodes, Pre-punchers and Insulation Plate

Buffer precipitates, dust, moisture or other solid material in the electrodes and pre-punchers or under the insulation plate may cause arcing. They can lead to current leakage, buffer contamination or carry-over. Cleaning these parts regularly will prevent this.

The electrodes, pre-punchers and the insulation plate should be cleaned regularly. Depending on the application, cleaning frequency can be for example once a week, or if peaks show unusual tailing or unusual peak shoulders. Please be aware that the EMF counter analysis start lets you set customized limits for warnings. Cleaning is necessary if arcing or excessive current leakage is observed. Usage of creeping buffers, such as urea, may lead to higher cleaning frequency.

Steps for the cleaning procedure for electrodes, pre-punchers and the insulation plate:

- Prepare the Agilent CE instrument for this task
- Remove the covers
- Access the electrodes
- Access the liquid handling module
- Access the pre-punchers
- Clean the electrodes
- Clean the pre-punchers
- Clean the insulation plate
- Reinstall the pre-punchers
- Reinstall the insulation plate
- Reinstall the electrodes

NOTE Follow the common safety regulations for laboratories when doing this task. Wear safety glasses and rubber gloves.

NOTE Make sure you have disconnected the line power cord of the Agilent CE instrument before you proceed.

When	If arcing or excessive current leakage is observed.
Parts required	12 mm hexagonal socket screwdriver (included in the startup kit)
	Screwdriver for slotted screws (included in the startup kit)
	Screwdriver for cross head screws (included in the startup kit)
	Wash bottle with isopropanol
	Wash bottle with water
	Compressed inert gas, oil-free

Prepare the Agilent CE Instrument

Prior to maintenance do the following:

1. Make sure no analysis is running or will be started from the ChemStation.
2. Start monitoring your CE instrument with the Lab Advisor.
3. Select the **Tools** section in the instrument panel of the Lab Advisor.
4. Select the **CE control** screen and then **Maintenance positions**.

   These steps unload all lifters and move them to the lowest position. With all lifters in this position, the tray is freely movable. A dialog reports which lifters were unloaded in case vials were in the system.
5. Turn off the Agilent CE instrument.
6. Disconnect the line power cord from the Agilent CE instrument.
7. Disconnect any of the following connection if present: waterbath, external pressure supply and drainage.

WARNING **Hot lamp**

If you were using the Agilent CE instrument shortly before, the lamp may be very hot.

- **Avoid touching the lamp.**
- **Wear protective gloves.**

Remove the Covers

1 Open the top cover.

2 Remove the capillary cassette (see "Removing the Capillary Cassette from the Agilent CE Instrument" on page 121)

3 Turn the front cover screws by a quarter of a turn to vertical orientation.

They are not meant to be removed completely.

4 Open the door to the cabinet a little.

5 Carefully pull the front cover away from the main frame.

Pull steadily on both sides. You will need slightly more force to remove the right side due to a connector. Turn the screws back to horizontal orientation.

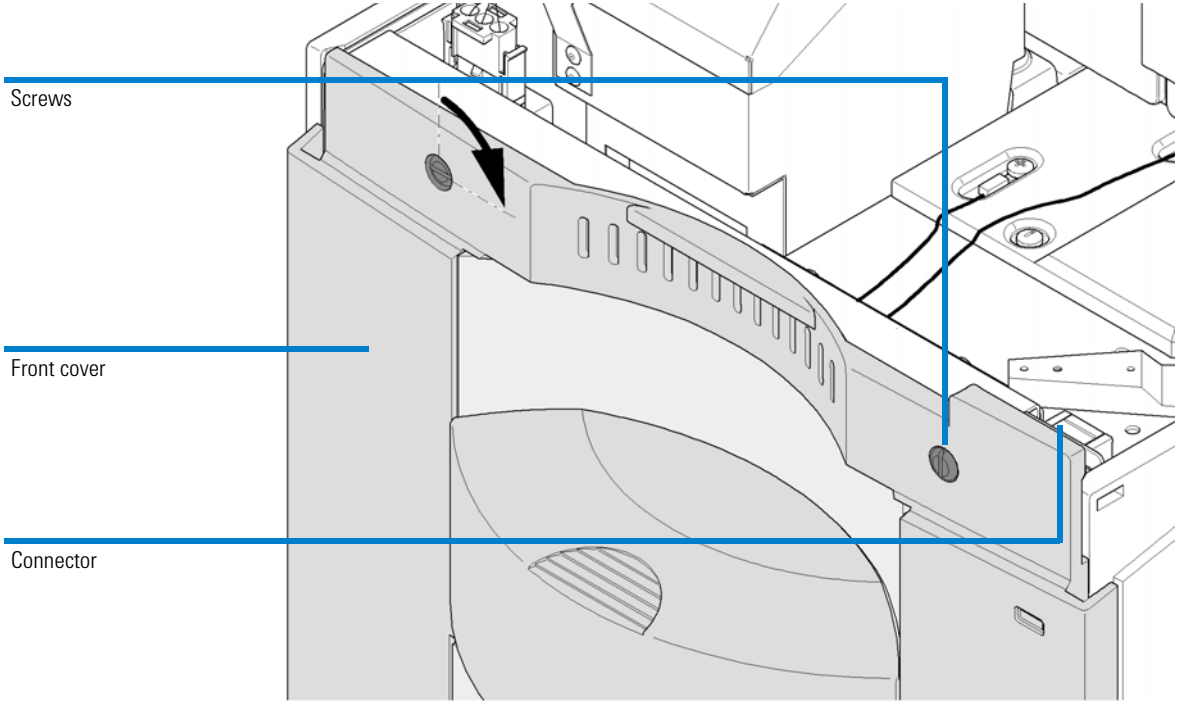

Figure 57 Removing the front cover

Accessing the Electrodes

1 Use a screwdriver to unscrew the two metal screws holding the insulation plate.

2 Use a screwdriver to remove the screw that secures the blue ground cable.

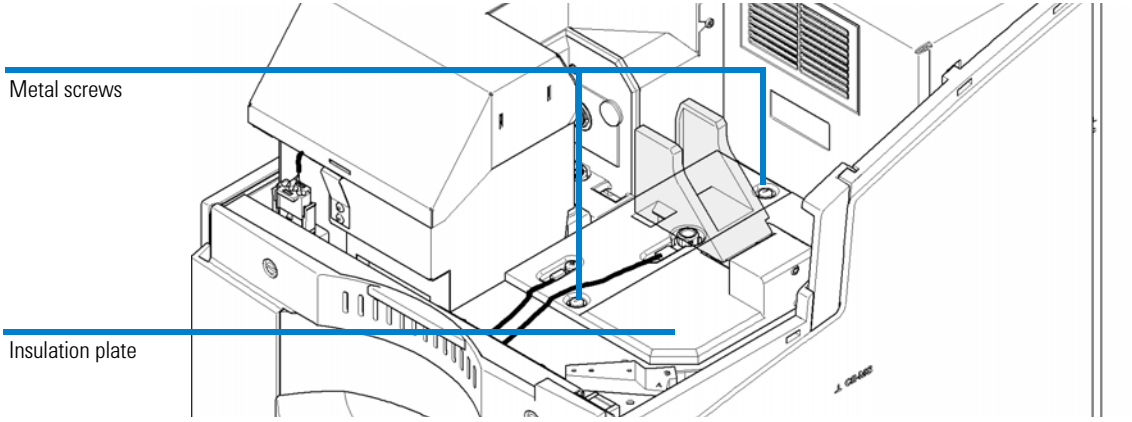

Figure 58 Insulation plate

3 Use the 12 mm hexagonal socket screwdriver to unscrew the inlet electrode.

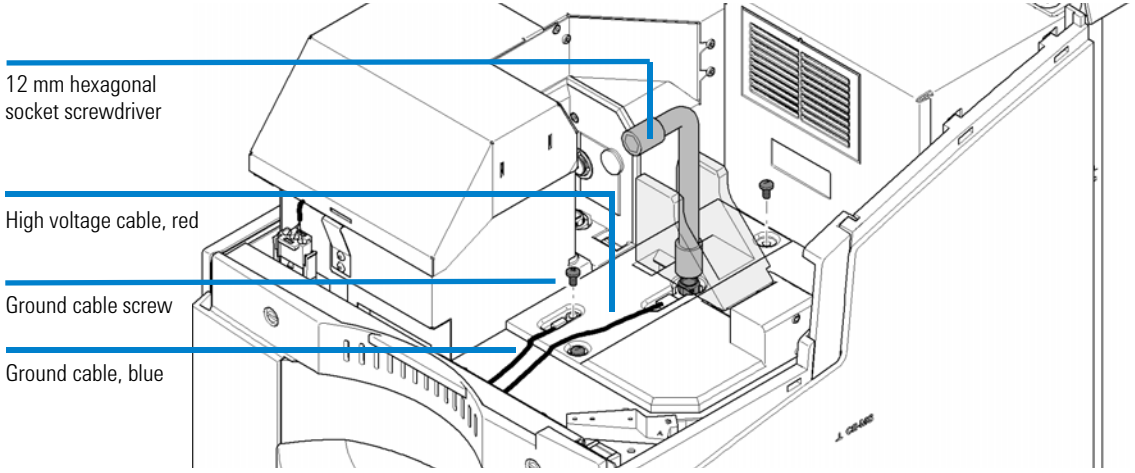

Figure 59 Removing the ground cable and the inlet electrode cable

4 Carefully lift the red high voltage wire. The inlet electrode will come out.

5 Slowly slide the insulation plate first to the right (1.), then tilt it up (2. and 3.) and finally take it out.

Make sure that the outlet electrode is not touching the foam of the tray cooling or the lift station.

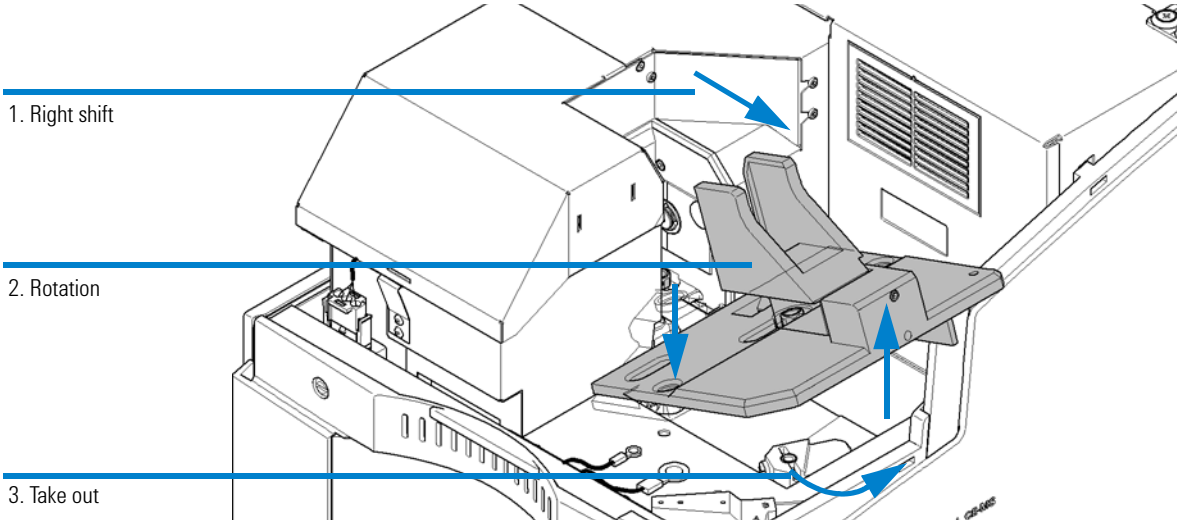

Figure 60 Removing the insulation plate

NOTE It is not possible to remove the outlet electrode without taking out the insulation plate.

6 Remove the outlet electrode from the insulation plate using the 12 mm hexagonal socket screwdriver.

Accessing the Liquid Handling Module

CAUTION

Damage to tubes and liquid spills

Keeping tubes connected on the left side of the instrument while pulling out the liquid handling module will damage the tubes and might lead to liquid spills.

Disconnect any external pressure supply, drainage or connections to an external water bath for tray cooling prior to accessing the liquid handling module.

CAUTION

Damage to the instrument

Damage may lead to a non-operational instrument.

- Do not lift the liquid handling module upwards, outside the instrument. The module is connected to the main frame by two flat ribbon cables and two flexible tubes. When lifting it up, the liquid handling module might come off the guiding rail and the connections might be affected.

1. Use a screwdriver to unscrew the slotted screws holding the liquid handling module in the instrument.
2. Take the electrolyte and waste bottles out of the cabinet. Keep them connected and place them in front of the instrument.
3. Carefully pull the liquid handling module out from the main frame. Pull steadily in the middle until you reach the end position. Carefully avoid damaging the replenishment needle.

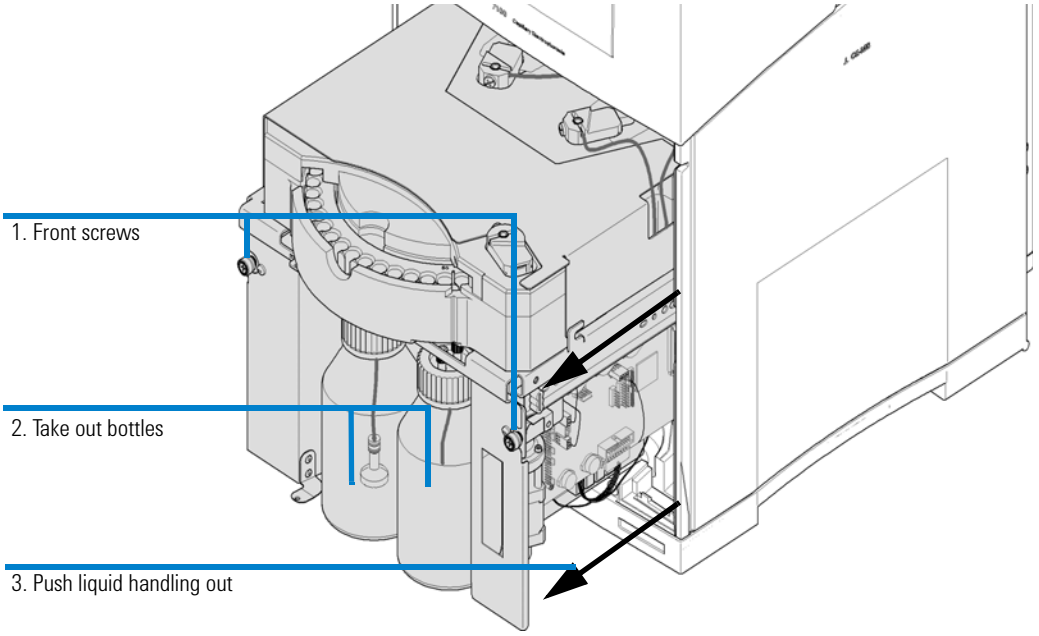

Figure 61 Accessing the liquid handling module

Accessing and Removing the Pre-punchers

Inlet and outlet lifts are located behind the sample tray in the rear of the liquid handling module. The replenishment lift is located in the front on the right side under the replenishment needle.

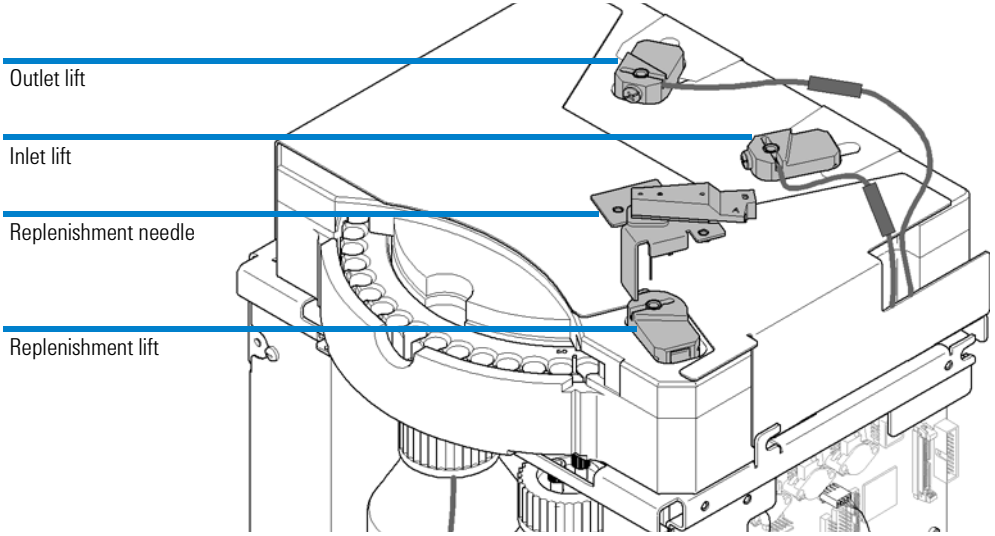

Figure 62 Inlet and outlet lifts, replenishment lift and replenishment needle

NOTE Do not touch or bend the replenishment needle when handling the pre-punchers.

WARNING

Risk of injury due to sharp tips

The pre-punchers have very sharp tips.

- **Be careful when touching the tips of the pre-punchers.**

1 Remove the plastic screw which secures the pre-punchers using a Pozidriv screwdriver.

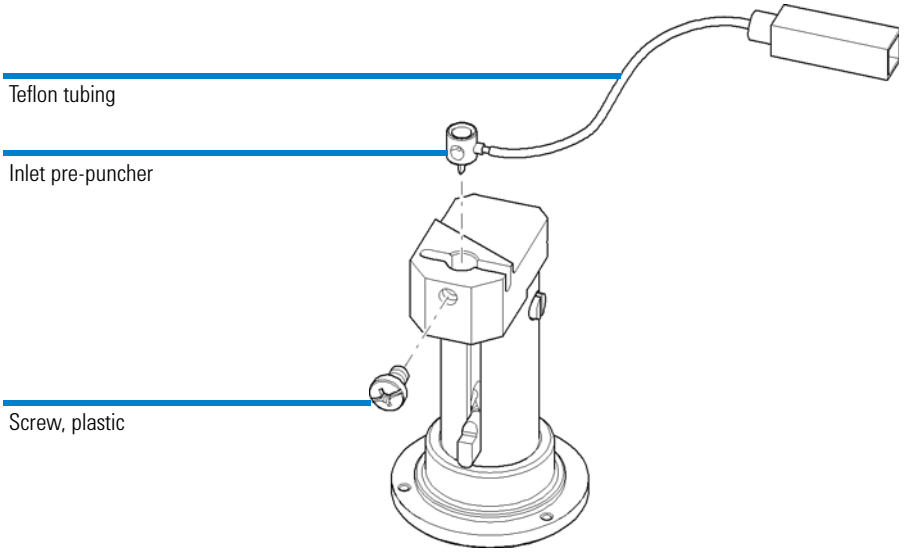

Figure 63 Plastic screw of the pre-puncher

2 The pre-puncher has a hole which can be used to gently lever it out using a paper clip. Carefully pull the pre-puncher out of the inlet, outlet and replenishment lift.

3 Unscrew the teflon inlet pre-puncher tubing (labeled 7 on the tubing), the outlet pre-puncher tubing (labeled 8). The pre-puncher for the replenishment lift is not connected to a tube.

NOTE The outlet lifter tubing (labeled 8) might be physically disconnected from the pressure system. This status is advantageous in case no high pressure applications are used. This connection is required for applications in CE+p and CEC mode.

NOTE The teflon tube does NOT need to be removed from the pre-punchers for cleaning. If the connection between the tube and the pre-puncher is not tight, since the tube became wider, shorten the tube and shift it on the pre-puncher again.

Cleaning the Electrodes

1 Flush the electrodes with water. Watch for salt crystals. All salt crystals must be removed.

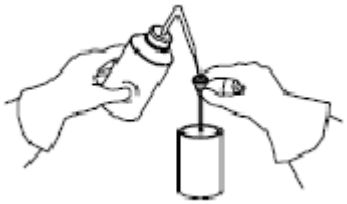

Figure 64 Flushing electrodes

2 Flush the electrodes with isopropanol.

3 Use compressed air to dry the electrodes and remove all traces of liquid.

CAUTION

Increased leakage current and arcing due to wet electrodes

Increased leakage current and arcing might appear during analysis if electrodes are not completely dry.

- To avoid contamination, the inside of the electrodes must be completely dry before reinstallation.

NOTE

If there is still an accumulation of dirt in the upper funnel or inside the electrode start the cleaning procedure again. You may place it in a beaker of water or isopropanol and treat this in an ultrasonic bath for 5 minutes followed by steps 2 and 3 in this section. If this fails, replace the electrode.

Cleaning the Pre-punchers

- Check for damaged or bent tips before cleaning the pre-punchers.

  If the tips are damaged, replace the pre-punchers.
- Check for grooves in the funnels of the pre-punchers.

  Grooves are a sign of improper alignment of the electrodes and may lead to improper sealing. Improper sealing may lead to problems during flushing, injection or CEC applications. Use the alignment center of the Lab Advisor to align and check the installation. If the funnel shows grooves, replace the pre-punchers.

WARNING

Risk of injury due to sharp tips

The pre-punchers have very sharp tips.

- **Be careful when touching the tips of the pre-punchers.**

1 Flush the pre-punchers with water. Watch for salt crystals. All salt crystals must be removed. Take particular care with the teflon tube connector.

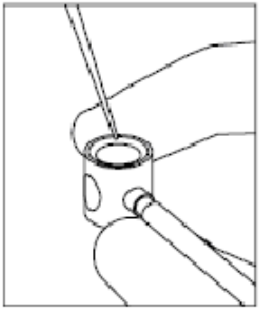

Figure 65 Flushing pre-punchers

2 Flush the pre-punchers with water and isopropanol.

3 Use compressed air to dry the pre-punchers and remove all traces of liquid. Do not forget to dry the connected tubes as well.

NOTE If there is an accumulation of dirt in the pre-puncher funnel, put the pre-punchers and connecting tubing in a beaker of water and treat it in an ultrasonic bath for five minutes followed by steps 2 and 3 in this section.

NOTE Residual liquid in connecting tubes may be transported to the air valve blocks and result in damage. Such liquid plugs may also negatively influence injection reproducibility.

Cleaning the Insulation Plate

Salt crystals, films of substances such as buffer or gel that allow moisture will lead to increased leakage current or even arcing. The insulation plate must be free of such contamination.

1. Moisten a tissue with water and use it to clean the insulation plate.
2. Moisten a tissue with isopropanol and use it to clean the insulation plate.
3. Dry the insulation plate with a tissue and compressed air.

Reinstalling the Pre-punchers

1 Carefully insert the pre-puncher (labeled 8) in the outlet lift. Connect the tube to its connector (labeled 8) if you run applications in the CE+p and CEC mode. The fitting of the outlet pre-puncher must be tight. Otherwise, problems may occur during CEC mode.

NOTE If you do not run applications in CE+p and CEC mode, keep the tube disconnected and fix the tubing in such way that it does not disturb the movement of the inlet lifter.

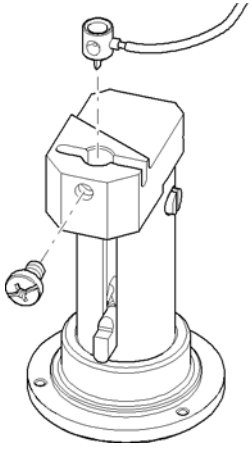

Figure 66 Inserting the pre-puncher

2 Carefully insert and tighten the plastic screw to secure the pre-puncher.

The pre-puncher will assume the correct position as the screw is tightened.

3 Carefully insert the inlet pre-puncher with the air pressure tube (labeled 7) connected in the inlet lift. Connect the tube to its connector (labeled 7).

The fitting of the inlet pre-puncher must be tight. Otherwise, pressure or injection problems may result.

4 Carefully insert and tighten the plastic screw to secure the pre-puncher.

The pre-puncher will assume the correct position as the screw is tightened.

NOTE The screws used for fixation of the inlet and outlet pre-puncher are made of plastic. Do not use metal screws. Metal screws may lead to leakage current and arcing which disturbs applications and may damage the instrument.

5 Carefully insert the replenishment pre-puncher. Tighten the screw to secure the pre-puncher.

The pre-puncher will assume the correct position as the screw is tightened. The replenishment pre-puncher is not connected to a tube.

Reinstalling the Electrodes and the Insulation Plate

1. Reinstall one electrode in the outlet electrode position on the insulation plate.
2. Thread the electrode into the outlet position on the insulation plate by hand first.
3. Tighten the electrode with the 12 mm hexagonal socket screwdriver.

   Do not overtighten. Do not bend the electrodes.
4. Holding the insulation plate by the cassette holder, slide the insulation plate under the detector (1.), then tilt it up into place (2.) and push it completely to the left (3.).

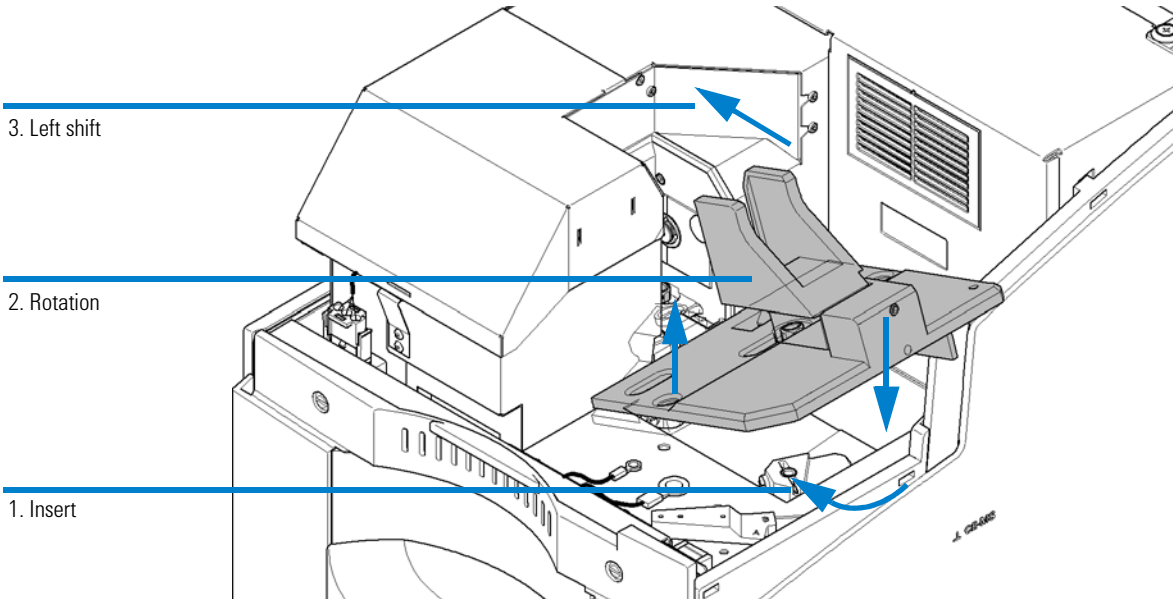

Figure 67 Installation of the insulation plate

5 The insulation plate should be laying flat in position.

The insulation plate is correctly positioned under the detector if the top part of the outlet electrode is fits through an oval cut-out.

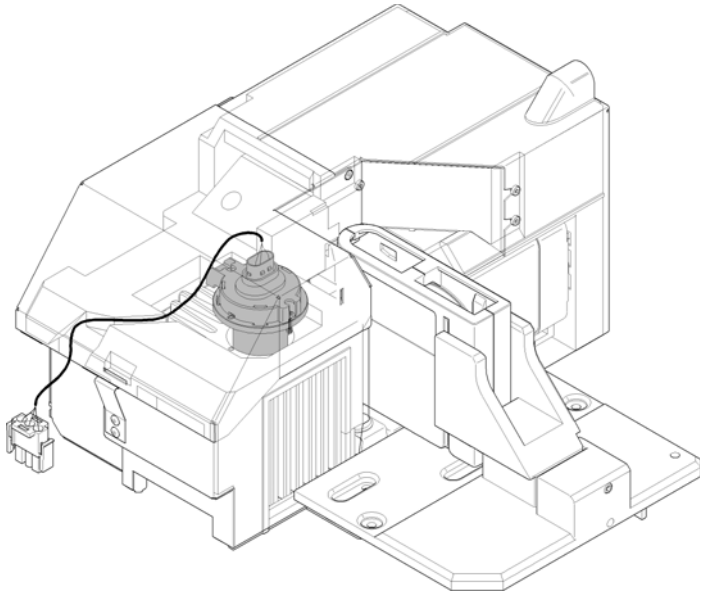

Figure 68 Alignment of the detector

6 Secure the insulation plate by reinstalling the two slotted metal screws.

7 Reconnect the blue ground wire and fasten the metal screw.

8 Insert the inlet electrode into the ring connector of the red high voltage wire. Thread the inlet electrode (and the ring connector) into the insulation plate by hand, then tighten the inlet electrode with the 12 mm hexagonal socket screwdriver.

Do not overtighten.

9 Push the liquid handling module back into the instrument as shown in Figure 70 on page 213. To release it from the front position, slightly more force is needed. Carefully move the liquid handling module completely into a position that allows fixation. Please note the metal nose from the liquid handling module which has to fit in a hoe of the back metal sheet as shown in Figure 69 on page 212.

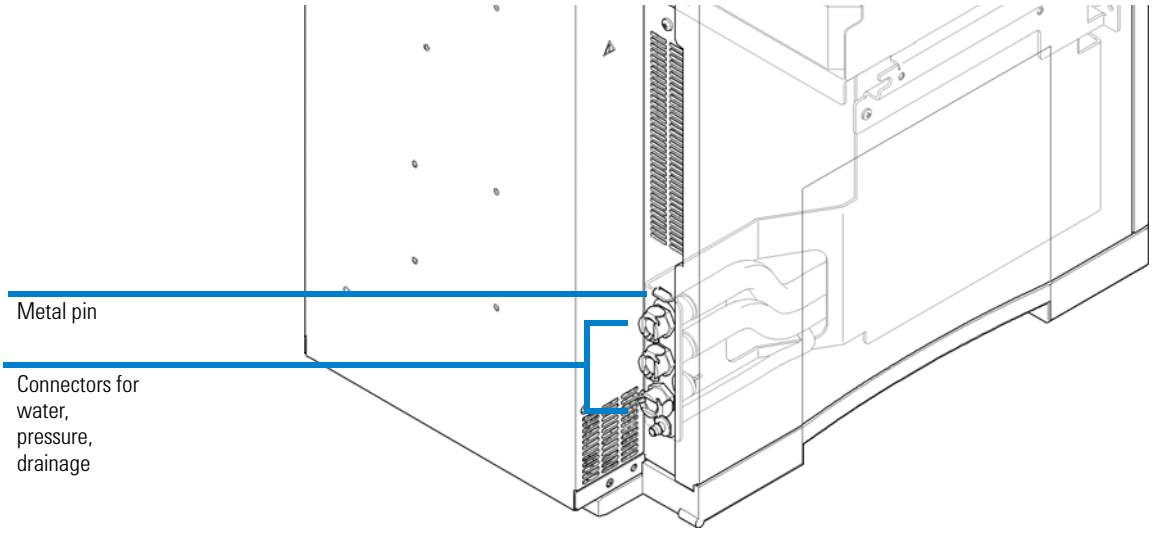

Figure 69 Rear side of liquid handling module

NOTE

Take care not to damage tubes and flat ribbon cables on the right-hand side of the liquid handling module.

Take care that the connectors on the left-hand side, for example for the drainage, fit into their cut-out in the back.

10 Tighten the slotted screws in the front of the liquid handling module.

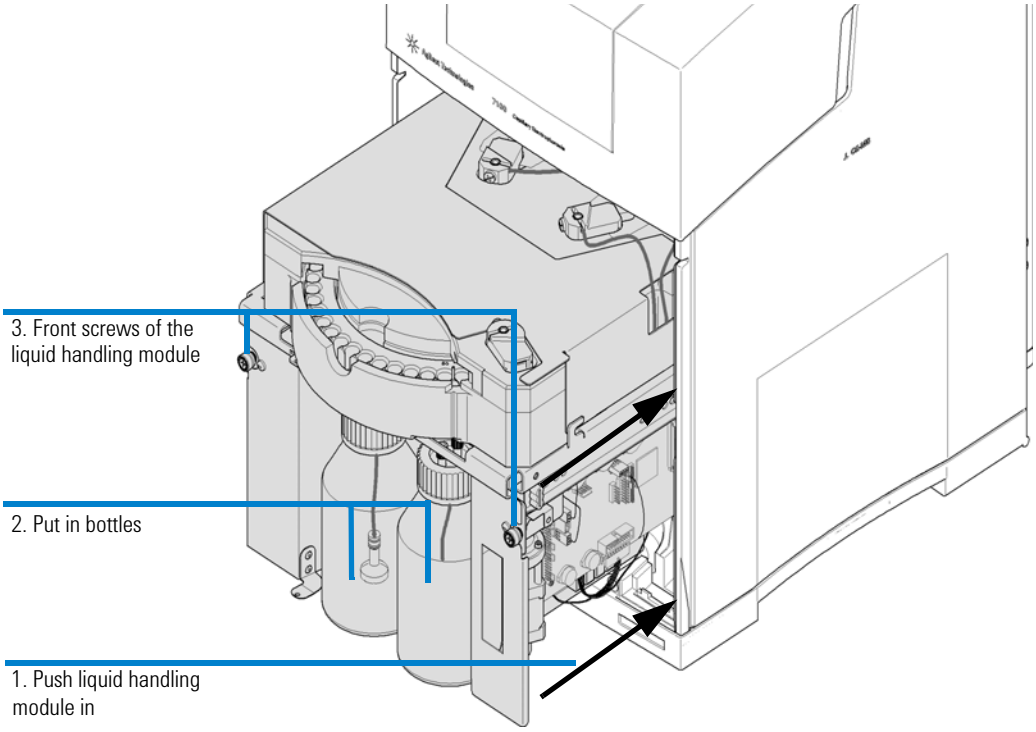

Figure 70 Liquid handling module

11 Reconnect the line power, drainage, external pressure supply, the connectors for an external cooling bath (if applicable), and switch on the instrument.

12 Reestablish the connection to the instrument from the Lab Advisor software. Select **Start monitoring**.

NOTE

No high voltage can be applied, if the front cover is removed. Touching the electrodes inside the instrument is safe. However, under the following circumstances (usage of the alignment center), slow lifter movements with a low force are possible with the following alignment procedure. When you start any lifter movement your hands should be outside the instrument.

13 Open the **CE Control** screen under **Tools** in the Lab Advisor software. Select the **Alignment Center**. The alignment procedure can be started with the front cover un-installed.

14 Follow the procedure to align the inlet and outlet electrode and the replenishment needle.

The procedure consists of a prepare step and an alignment check.

The alignment is done while the pre-puncher of the respective lift is raised until it is near the electrode or needle tip (prepare-button). Now you can insert the capillary of the electrode alignment tool from the funnel of the electrode. With careful puncture you can check if the electrode exit points fit exactly to the pre-puncher funnel exit. The electrode or needle might need careful manual bending to make it point towards the exect center of the pre-puncher funnel.

During the alignment check (check-button), the electrode or replenishment needle passes through the funnel several times. An improperly aligned electrode slides along the pre-puncher funnel. The orientation is optimum if the electrode does not move sidewards during this dynamic check.

NOTE Although electrodes will most likely not need alignment thanks to their design, you should still perform the check alignment procedure.

NOTE The electrodes are fragile. Manual bending during alignment should be done only with great care. Electrodes must be kept straight. Avoid curving.

Reinstall the Capillary Cassette

See “Inserting the Cassette” on page 132.

Reinstall the Front Cover

1. Make sure the front cover screws have a horizontal orientation. They can only click into place in this orientation.
2. Keep the front door of the cabinet slightly open.
3. Start mounting the front cover by inserting it at the lower end first.
4. Carefully push the front cover into the main frame.

   You might need to pay special care on the right side due to a connector.
5. Close the lid of the instrument.

Maintenance of the Replenishment System

The replenishment system automatically empties and refills the buffer vials in the tray with new buffer from the electrolyte bottle. Typically, replenishment is done before every run or after every 3 to 4 runs, depending on the stability and volume of the running buffer. Initial preparation of the replenishment system is described in "Preparing the Replenishment System if Needed" on page 111. Please see the general instructions on operations for replenishment maintenance such as flush tubes, clean tubes and clean level sensor ("Operations for Replenishment Maintenance" on page 219).

Frequency

The replenishment system (bottles and tubing) should be cleaned if:

- using it for the first time,
- changing the buffer, or
- the replenishment system will be idle for some time.

Requirements

- Vials and caps
- Water and/or buffer and isopropanol (depending on the protocol selected)
- ChemStation, Lab Advisor or Instrument Utilities software

Changing the Buffer Composition in the Replenishment System

Please follow these steps.

1. Open the Lab Advisor or Instrument Utilities software and start monitoring the respective instrument.
2. In the **Tools** section, select the **CE Control** screen and click on **Change Bottles** to release the pressure before you open the bottles.
3. Take out the electrolyte bottle and unscrew the cap. The electrolyte bottle has a frit and tubing inside. The frit must not get dirty.
4. Fill a minimum 300 mL of buffer into the electrolyte bottle. Make sure the buffer is filtered by using a 0.25 µm or 0.45 µm filter depending on its viscosity.
5. Make sure the waste bottle is empty.
6. Cap the bottles tightly.
7. Choose **Done** in the **Change Bottles** dialog box. Wait until the pressure has built up again.
8. To flush the internal tubing system from the electrolyte bottle to the waste bottle including all valves on this pathway, select **Flush Tubes**. During this step the replenishment needle itself is not flushed. Set a flushing time of 0.3 minutes.
9. To clean the internal tubing system, including the replenishment, select **Clean Tubes**. During this step the replenishment is used to fill and empty a vial several times. Set the number of repetitions to 5.
10. When requested to do so, place a capped and empty vial into a tray position.

The involved volume of the replenishment system is about 5 mL. A 10-time flush is sufficient. The flush time depends primarily on the viscosity of your buffer. Therefore, choose a short time and repeat flush tubes if necessary, otherwise it is possible that the buffer is flushed completely into the waste bottle. This protocol suggests a combination of flush tubes first and a subsequent clean tubes step, with comparably low volume consumption, for a high exchange efficiency and low buffer consumption.

The Replenishment System Will Not Be Used for Some Time

The replenishment system should be flushed first with water and then with isopropanol.

Please follow these steps.

1. Open the Lab Advisor or Instrument Utilities software and start monitoring the respective instrument.
2. In the tools section, select the **CE Control** screen and click on **Change Bottles** to release the pressure before you open the bottles.
3. Take out the electrolyte bottle and unscrew the cap. The electrolyte bottle has a frit and tubing inside. The frit must not get dirty.
4. Fill a minimum 300 mL of water into the electrolyte bottle. Make sure the water is filtered by using a 0.25 µm or 0.45 µm filter depending on its viscosity.
5. Make sure the waste bottle is empty.
6. Cap the bottles tightly.
7. Choose **Done** in the **Change Bottles** dialog box. Wait until the pressure has built up again.
8. To flush the internal tubing system from the electrolyte bottle to the waste bottle, including all valves on this pathway, select **Flush Tubes**. During this step the replenishment needle itself is not flushed. Set a flushing time of 2 minutes.
9. To clean the internal tubing system, including the replenishment, select **Clean Tubes**. During this step the replenishment is used to fill and empty a vial several times. Set the number of repetitions to 5.
10. When requested to do so, place a capped and empty vial into a tray position.
11. Execute the clean level sensing operation to clean the replenishment needle entirely.
12. Repeat all steps starting with number 2 and use isopropanol instead of water. Empty the waste bottle whenever you fill or refill the electrolyte bottle.

Further Action

If the instrument cannot build-up pressure or a vacuum after performing the above steps, check the following:

1 Proper seal of the electrolyte bottle

2 Proper seal of the waste bottle

3 Tight fittings

If none of these reasons apply, call Agilent Technologies.

Operations for Replenishment Maintenance

The following operations can be started from the ChemStation, Lab Advisor or Instrument Utilities software. From the ChemStation, they can be done by clicking the replenishment vial. It is a vial located between the replenishment bottles in the CE dialog. From the Lab Advisor or Instrument Utilities software, start monitoring, visit the **Tools** section and the **CE Control** screen.

Flush Tubes

The **Flush Tubes** operation directly flushes water, buffer or other cleaning solutions from the electrolyte bottle to the waste bottle. During this task, a reduced pressure is utilized in the electrolyte bottle. The user can set a time for this operation.

The volume in the tubing system from the electrolyte bottle and the waste bottle is about 5 mL. It is recommended that you flush at least with 10-fold volume of fresh buffer. The exchange flow rate of water is approximately 120 to 150 mL/min. Please note the individual viscosity of your buffer system.

It is important to make sure that there is enough buffer (for example a minimum of 300 mL) in the electrolyte bottle for the **Flush Tubes** operation. An excessive **Flush Tubes** time will drain the electrolyte bottle, causing air bubbles to be introduced into the system.

The **Flush Tubes** command does not include a cleaning of the replenishment needle. It requires an execution of the **Clean Tubes** function to clean the last part to the fill needle of the replenishment needle.

Clean Tubes

The **Clean Tubes** operation is meant to replace liquid in tubing from the electrolyte bottle to the replenishment needle and from the replenishment needle to the waste bottle. A vial is lifted to the replenishment needle and filled several times. The number of filling/emptying cycles can be set by users using the Lab Advisor/Instrument Utilities software. This operation is meant for buffer change purposes or for cleaning with water.

It is important to make sure there is enough buffer in the electrolyte bottle for the **Clean Tubes** number of filling/emptying cycles specified (for example a minimum of 50 mL). An excessive **Clean Tubes** time will drain the electrolyte bottle, causing air bubbles to be introduced into the system.

The volume in the tubing system from electrolyte bottle and the waste bottle is approximately 5 mL. Please note that a relatively high amount of buffer is located in the glass frit of the electrolyte bottle. It is recommended that you use the **Flush Tubes** command first to flush the direct tubing connection from the electrolyte bottle to the waste bottle with at least for example 10-times the volume of fresh buffer. Please note the individual viscosity of your buffer system.

NOTE If the replenishment system will not be used for some time, it should be cleaned first with water and then with isopropanol by the **Flush Tubes** and **Clean Tubes** operations.

Clean Level Sensor

The purpose of the Clean Level Sensor functionality is to dissolve small buffer crystals which may have formed in the tip of the level sensing needle (short needle of the double needle) in the replenishment needle assembly. Remaining pathways of the internal tubing of the level sensing circuit are also cleaned. One indication to use this function is failed level sensing during operation. The other indication is a failed IRP (Injection Replenishment and Pressure) level sensing test from the injection replenishment system tests of the Lab Advisor. You may use this procedure as well if you leave the replenishment systen unused for a while.

This function prompts you to load tray position 48 (or user input) with a vial filled with an appropriate cleaning liquid (usually water or current buffer system). When initiated, 8 cleaning cycles are performed.

A cycle consists of:

1 Submerging the short needle into the cleaning liquid and briefly sucking cleaning liquid into the short needle.

2 Removing the short needle from the cleaning liquid, and sucking a slug of air into the short needle.

The alternate slugs of liquid and air exit the level sensing tubing into the waste bottle. The main screen reply line counts the cycles as they take place. You can check for proper function afterwards with the IRP level sensing test from the injection replenishment system tests or by performing buffer replenishment in a vial.

NOTE This function is designed to prevent a gradual build-up of buffer crystals. Large, solid plugs of precipitate which have been allowed to form in the short needle may not be removable using this function. In such cases, we recommend exchanging the restrictor capillaries and or the replenishment needle by personnel trained by Agilent Technologies.

NOTE If the replenishment system will not be used for some time the level sensor should be cleaned with water. Subsequently the replenishment system should be cleaned with water and then with isopropanol by the **Flush Tubes** and **Clean Tubes** operations.

Changing the Air Inlet Filter

Objective

The following procedure is used to replace the air inlet filter. The installed air pump uses ambient air (through this filter) to create pressure inside the electrolyte bottle. The compressed air is needed to flush a capillary and to inject a sample.

Frequency

Air filter replacement should be considered if the environment is very dusty or if the system cannot generate enough pressure. We suggest that you change the air filter at least every three months.

Accessing the Air Filter

The air filter is located inside the electrolyte and waste bottle compartment, see Figure 71 on page 223. Therefore, it is very easy to replace the air filter frequently.

If the instrument cannot build-up either pressure or a vacuum, check the following:

- proper seal of the pressure bottle,
- proper seal of the vacuum bottle, and
- loose fittings on the bottles

If none of these reasons apply, call Agilent Technologies.

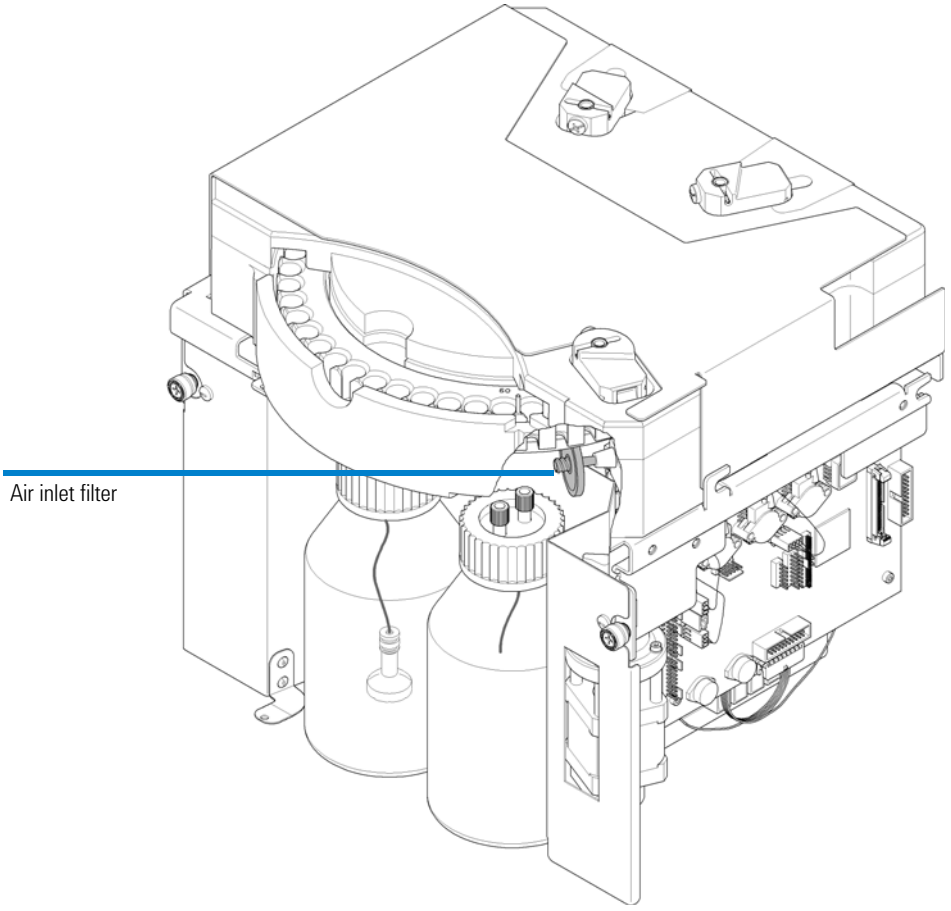

Figure 71 Air inlet filter

NOTE Do not run the instrument without the air filter installed, since particles may damage the valve system.

Changing the Lamp

The following procedure is used to replace the deuterium lamp in the 7100 CE instrument. Loss of light intensity over time increases baseline noise, which may negatively influence the performance of your analysis.

You should consider exchanging the lamp if a drastic increase in the noise level is encountered which is not caused by any other reason (for example contaminated slit, something absorbing inside the capillary, etc.) or the lamp refuses to ignite. Generally the light intensity drops by 50 % of its original value after approximately 2000 hours of operation. We suggest that you check the lamp intensity before you change the lamp to be sure the noise increase is not due to other reasons (air bubbles inside the capillary, alignment interface or detection window contaminated).

Please use the **Intensity Test** in the **Detector Test** suite in the Lab Advisor/Instrument Utilities software to determine the lamp intensity. Check the Lab Advisor/Instrument Utilities software to read out the lamp tag information on the current lamp lifetime.

It may happen that a hot lamp refuses to ignite the first time. Please wait until the lamp has cooled down.

NOTE

Only lamps provided by Agilent Technologies are supported in the 7100 CE instrument. The lamp tag stores various data and details on the ignition program of the deuterium lamp. A lamp without a tag will fail to ignite and could lead to instrument errors.

Removing the Existing Lamp

Parts required

Pozidriv screwdriver (part of the accessory kit).

Deuterium lamp for the Agilent CE instrument.

1. Select **Exit** from the **File** menu to exit the Agilent ChemStation. Exit both online and offline copies.
2. Turn off the line power to the Agilent CE instrument.
3. Open the top cover.
4. Open the detector cover.

5 Disconnect the lamp cable's 8-fold connector. Pull the connector, not the cable.

WARNING

Injuries due to burns

Touching a hot lamp can cause serious burns.

- If you were using the instrument shortly before, the lamp may be very hot. Wait until it has cooled down before touching the lamp.

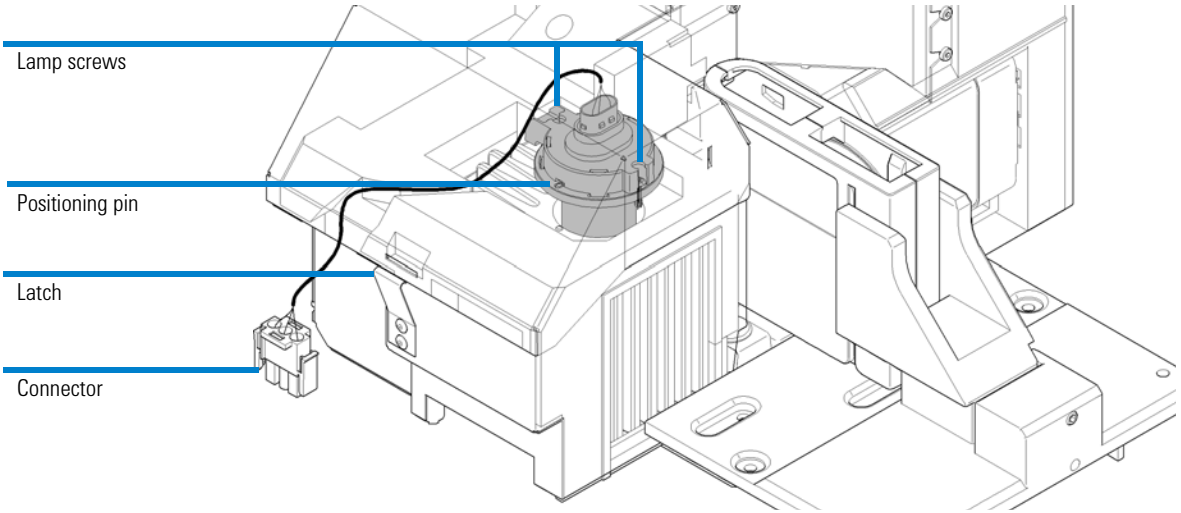

Figure 72 Exchanging a lamp

6 Loosen the two lamp screws using the Pozidriv screwdriver and lift the lamp out carefully.

Inserting a New Lamp

1. Hold the new lamp by the metal ring to avoid touching the glass surface. Fingerprints absorb light and can reduce light intensity.
2. Insert the lamp into the lamp compartment. Position the lamp so that the notch in the lamp ring matches with the pin on the detector housing.
3. Tighten the two lamp screws.
4. Connect the lamp cable connector and fix the cables into the channel in the foam.
5. Close the detector lid without clamping the lamp cable.
6. Close the top cover. Turn line power on.
7. Boot the Agilent ChemStation and turn the lamp on.
8. Allow the lamp to warm up for about 1 hour.
9. Perform an **Intensity Test** in the **Detector Test** suite in the Lab Advisor/Instrument Utilities software to determine the initial lamp intensity of your new lamp. Store the result for you own reference.

Further Action

If the instrument fails this test, check the following:

- correct seating and connection of the lamp cables,
- correct seating of the cassette, and
- if the green alignment interface without capillary is used, check for contamination of the interface.

If none of these reasons apply, call Agilent Technologies.

Cleaning the Instrument

The instrument case should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and mild detergent. Do not use an excessively damp cloth as liquid may drip into the instrument.

WARNING

Risk of instrument damage

Liquid dripping into the electronic compartment of your module.

Liquid in the module electronics can cause shock hazard and damage the module.

- Do not use an excessively damp cloth during cleaning.
- Drain all solvent lines before opening any fittings.

9
Parts and Materials for Maintenance

Overview of Maintenance Parts 230

This chapter provides information on the parts required for maintenance.

Overview of Maintenance Parts

Table 26 Maintenance parts

Description	Part Number
Long life Deuterium lamp (8-pin)	**5190-0917**
Long life HiSensitivity Deuterium lamp (8-pin)	**5190-0916**
Electrode assembly, standard	**G7100-60007**
Electrode assembly, short	**G7100-60033**
Electrode O-ring, silicone 5/pk	**5062-8544**
Electrolyte bottle, 500 mL	**9300-1748**
Electrolyte bottle, 100 mL	**5042-6478**
Electrolyte bottle cap	**9300-1747**
Bottle sealing O-ring	**0905-1163**
Glass filter, solvent inlet	**5041-2168**
Filter frit adapter, 3 mm, 4/pk	**5062-8517**
Pre-puncher	**G1600-67201**
Screws for pre-puncher, 10/pk	**G1600-62402**
Air filter, 5 µm	**3150-0619**
Capillary cassette	**G7100-60002**
Optical filter for DAD, 260 nm	**G7100-62700**
Vials	**See Table 23**
Alignment interfaces	**See Table 24**
Fuses	**See "7100 Capillary Electrophoresis Instrument Electronics" on page 173**

10 Appendix

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This chapter provides additional information regarding safety, legal considerations and Agilent information on the Internet.

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

General

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any intended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Some adjustments described in the manual, are made with power supplied to the instrument, and protective covers removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided whenever possible. When inevitable, this has to be carried out by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

When working with solvents please observe appropriate safety procedures (e.g. safety glasses, gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when toxic or hazardous solvents are used.

Safety Symbols

Table 27 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	Indicates eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

- Do not proceed beyond a warning until you have fully understood and met the indicated conditions.

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

- Do not proceed beyond a caution until you have fully understood and met the indicated conditions

Allgemeine Sicherheitsinformation

Die folgenden allgemeinen Sicherheitshinweise sind in allen Betriebsphasen sowie bei der Wartung und Reparatur des Gerätes zu beachten. Die Nichtbeachtung dieser Vorsichtsmassnahmen bzw. der speziellen Warnungen innerhalb dieses Handbuchs verletzt die Sicherheitsstandards der Entwicklung, Herstellung und vorgesehenen Nutzung des Gerätes. Agilent Technologies übernimmt bei Nichteinhaltung dieser Vorschrift durch den Kunden keine Haftung.

Allgemein

Dies ist ein Gerät der Sicherheitsklasse I (mit Erdungsanschluss). Es wurde entsprechend internationaler Sicherheitsstandards gefertigt und getestet.

Betrieb

Beachten Sie vor dem Anlegen der Netzspannung die Installationsanweisungen. Darüber hinaus sind folgende Punkte zu beachten:

Während des Betriebs darf das Gehäuse des Geräts nicht geöffnet werden. Vor dem Einschalten des Gerätes müssen sämtliche Massekontakte, Verlängerungskabel, Spartransformatoren und angeschlossenen Geräte über eine geerdete Netzsteckdose angeschlossen werden. Bei einer Unterbrechung des Erdungsanschlusses besteht die Gefahr eines Stromschlags, der zu ernsthaften Personenschäden führen kann. Das Gerät muss außer Betrieb genommen und gegen jede Nutzung gesichert werden, sofern der Verdacht besteht, dass die Erdung beschädigt ist.

Vergewissern Sie sich, dass nur Sicherungen mit dem korrekten Nennstrom and dem richtigen Typ (normale Schmelzsicherung, träge Sicherungen usw.) verwendet werden. Die Benutzung reparierter Sicherungen sowie das Kurzschließen von Sicherungshaltern sind nicht zulässig.

Einige in diesem Handbuch beschriebenen Einstellarbeiten werden bei an das Stromnetz angeschlossenem Gerät und abgenommener Gehäuseabdeckung durchgeführt. Dabei liegen im Gerät an vielen Punkten hohe Spannungen an, die im Falle eines Kontaktschlusses zu Personenschäden führen können.

Sämtliche Einstellungs-, Wartungs- und Reparaturarbeiten am geöffneten Gerät sollte nach Möglichkeit nur durchgeführt werden, wenn das Gerät von der Netzspannung getrennt ist. Solche Arbeiten dürfen nur von erfahrenem Personal durchgeführt werden, das über die Gefahren ausreichend informiert ist. Wartungs- und Einstellarbeiten an internen Gerätekomponenten sollten nur im Beisein einer zweiten Person durchgeführt werden, die im Notfall Erste Hilfe leisten kann. Tauschen Sie keine Komponenten aus, solange das Netzkabel am Gerät angeschlossen ist.

Das Gerät darf nicht in Gegenwart brennbarer Gase oder Dämpfe betrieben werden. Ein Betrieb von elektrischen Geräten unter diesen Bedingungen stellt immer eine eindeutige Gefährdung der Sicherheit dar.

Bauen Sie keine Austauschteile ein und nehmen Sie keine nicht autorisierten Veränderungen am Gerät vor.

Kondensatoren in diesem Gerät können noch geladen sein, obwohl das Gerät von der Netzversorgung getrennt worden ist. In diesem Gerät treten gefährliche Spannungen auf, die zu ernsthaften Personenschäden führen können. Die Handhabung, Überprüfung und Einstellung des Gerätes ist mit äußerster Vorsicht auszuführen.

Beachten Sie bitte beim Arbeiten mit Lösungsmitteln die geltenden Sicherheitsvorschriften (z. B. Tragen von Schutzbrille, Arbeitshandschuhen und Sicherheitskleidung), wie sie in den Sicherheitsdatenblättern des Herstellers beschrieben sind; dies gilt speziell für der Handhabung giftiger oder gesundheitsgefährdender Lösungsmittel.

Sicherheitssymbole

Tabelle 28 Sicherheitssymbole

Symbol	Beschreibung
	Das Gerät ist mit diesem Symbol markiert, wenn der Benutzer im Handbuch nachlesen sollte, um sich vor Verletzungen und das Gerät vor Beschädigungen zu schützen.
	Weist auf gefährliche Spannungen hin.
	Weist auf einen Schutzkontakt (Erdung) hin.
	Das Licht der Xenon-Lampe in diesem Produkt kann bei direktem Blickkontakt zu Augenverletzungen führen.
	Das Gerät ist mit diesem Symbol versehen, wenn heiße Oberflächen vorhanden sind, mit denen der Benutzer nicht in Berührung kommen sollte.

WARNUNG

Der Sicherheitshinweis WARNUNG

weist Sie auf Situationen hin, die zu Personenschäden (u. U. mit Todesfolge) führen können.

- Fahren Sie bei einer Kennzeichnung durch einen Sicherheitshinweis erst fort, wenn Sie den Hinweis vollständig verstanden und entsprechende Maßnahmen getroffen haben.

VORSICHT

Der Sicherheitshinweis ACHTUNG

weist Sie auf Situationen hin, die zu einem möglichen Datenverlust oder zu einer Beschädigung des Geräts führen können.

- Fahren Sie bei einer Kennzeichnung durch diesen Sicherheitshinweis erst fort, wenn Sie diesen vollständig verstanden und entsprechende Maßnahmen getroffen haben.

Informations générales de sécurité

Les consignes générales de sécurité suivantes doivent être respectées lors de toutes les phases de fonctionnement, entretien et réparation de cet instrument. Le non-respect de ces consignes ou des mises en garde spécifiques énoncées ailleurs dans ce manuel, est en violation des normes de sécurité applicables à la conception, à la fabrication et à l'usage prévu de l'instrument. Agilent Technologies ne peut être tenu responsable du non-respect de ces exigences par le client.

Généralités

Cet instrument est un instrument de catégorie I (comportant une borne de mise à la terre) et a été fabriqué et contrôlé conformément aux normes de sécurité internationales.

Utilisation

Avant de brancher l'alimentation électrique, effectuez chaque étape de la procédure d'installation. Par ailleurs, vous devez respecter les consignes suivantes.

Ne retirez pas les capots de l'instrument pendant son fonctionnement. Avant la mise sous tension de l'instrument, toutes les bornes de mise à la terre, rallonges électriques, transformateurs et appareils qui y sont raccordés doivent être reliés à une terre de protection par le biais d'une prise de masse. Toute interruption de la connexion à la terre de protection crée un risque d'électrocution pouvant entraîner des blessures graves. Si l'intégrité de cette protection devient suspecte, l'instrument doit être mis hors service et son utilisation doit être interdite.

Assurez-vous que les fusibles sont remplacés uniquement par des fusibles à courant nominal spécifié et de type spécifié (fusion normale, temporisés, etc.). Ne pas utiliser de fusibles réparés et ne pas court-circuiter les porte-fusibles.

Certains des réglages décrits dans le manuel sont effectués sur un instrument sous tension dont les capots de protection ont été retirés. Les potentiels présents en de nombreux points peuvent causer des blessures.

Il convient d'éviter, dans la mesure du possible, d'effectuer des opérations de réglage, d'entretien et de réparation sur un instrument ouvert sous tension. Si c'est inévitable, ces opérations doivent être effectuées par une personne qualifiée et consciente du danger. Ne pas tenter d'effectuer une opération d'entretien ou un réglage sans la présence d'une autre personne capable de donner les premiers secours et d'assurer une réanimation. Ne pas remplacer les composants quand le câble d'alimentation est connecté.

Ne pas utiliser l'instrument en présence de gaz ou fumées inflammables. Le fonctionnement de n'importe quel instrument électrique dans un tel environnement présente un danger certain.

Ne pas effectuer des substitutions de pièces ni des modifications non autorisées.

Il se peut que les condensateurs situés à l'intérieur de l'instrument soit encore chargés, bien que l'appareil ait été débranché de sa source d'alimentation. Des tensions dangereuses sont présentes dans cet instrument, capables de causer des blessures graves. Vous devez procéder avec extrême précaution lorsque vous manipulez, testez et ajustez cet appareil.

Lorsque vous manipulez des solvants, respectez les règles de sécurité (port de lunettes, de gants et de vêtements de protection) décrites dans la fiche de données de sécurité fournie par le fournisseur du solvant, surtout si les solvants utilisés sont toxiques ou dangereux.

Symboles de sécurité

Tableau 29 Symboles de sécurité

Symbole	Description
	Cet appareil porte ce symbole pour indiquer à l'utilisateur de consulter le manuel d'utilisation afin de protéger l'opérateur contre tout danger et d'éviter d'endommager l'appareil.
	Indique des tensions dangereuses.
	Indique une borne de mise à la terre.
	Indique qu'il est dangereux pour les yeux de regarder directement la lumière produite par la lampe au deutérium utilisée dans ce produit.
	L'appareil comporte ce symbole pour indiquer qu'il présente des surfaces chaudes et que l'utilisateur ne doit pas les toucher lorsqu'elles sont chaudes.

AVERTISSEMENT

UN AVERTISSEMENT

vous met en garde contre des situations qui pourraient causer des blessures corporelles ou entraîner la mort.

- N'allez pas au-delà d'une mise en garde Avertissement tant que vous n'avez pas parfaitement compris et rempli les conditions indiquées.

ATTENTION

Le message ATTENTION

vous prévient lors de situations risquant d'entraîner la perte de données ou d'endommager l'équipement.

- N'allez pas au-delà d'une mise en garde Attention tant que vous n'avez pas parfaitement compris et rempli les conditions définies.

Informazioni generali sulla sicurezza

Le seguenti precauzioni generali di sicurezza devono essere rispettate durante tutte le fasi di utilizzo, manutenzione e riparazione dello strumento. Il mancato rispetto di tali precauzioni o di avvertenze specifiche riportate in altri punti del presente manuale implica la violazione degli standard di sicurezza della progettazione, della produzione e dell'uso previsto dello strumento. Agilent Technologies non riconosce alcuna responsabilità per eventuali danni risultanti dal mancato rispetto delle istruzioni fornite.

Informazioni generali

Questo strumento è classificato come facente parte della Classe di Sicurezza I (provvisto di terminale di messa a terra) ed è stato prodotto e collaudato in conformità con gli standard di sicurezza internazionali.

Funzionamento

Prima di attivare l'alimentazione, seguire le istruzioni della sezione relativa all'installazione. Inoltre, osservare quanto segue:

Non rimuovere i coperchi dello strumento mentre è in funzione. Prima di accendere lo strumento, collegare tutti i terminali di messa a terra, le prolunghe, i trasformatori automatici e gli altri dispositivi ad esso collegati alla messa a terra di protezione tramite la speciale presa. L'eventuale interruzione del collegamento alla terra di protezione può provocare scosse elettriche, che possono causare lesioni gravi alle persone. Se si sospetta che lo strumento sia rimasto privo di protezione, scollegarlo subito e rimuoverlo dall'uso.

Verificare che, in caso di sostituzione dei fusibili, vengano utilizzati solo quelli con la corrente nominale richiesta e del tipo specifico (normale, ad azione ritardata e così via). Evitare l'uso di fusibili riparati e il corto circuito delle sedi dei fusibili.

Alcune modifiche descritte nel manuale devono essere effettuate con la corrente collegata e lo strumento privo di coperchi. La corrente presente in molti punti può, in caso di contatto, provocare lesioni alle persone.

Qualsiasi operazione di modifica, manutenzione e riparazione dello strumento aperto sotto tensione deve essere, per quanto possibile, evitata. Queste operazioni, quando inevitabili, devono essere eseguite da persone competenti e consapevoli del rischio a cui sono sottoposte. Non tentare riparazioni o modifiche interne se non è presente un'altra persona in grado di prestare soccorso e rianimazione. Non sostituire parti con il cavo di alimentazione collegato.

Non usare lo strumento in presenza di gas infiammabili o fumi. L'uso dello strumento, al pari di altre apparecchiature elettriche, in queste condizioni può compromettere la sicurezza.

Non installare parti di ricambio e non effettuare modifiche non autorizzate.

I condensatori all'interno dello strumento possono essere ancora carichi, anche se lo strumento non è collegato alla presa di corrente. Questo strumento utilizza tensioni pericolose, in grado di provocare gravi lesioni alle persone. Usare, collaudare e riparare lo strumento con la massima cautela.

Durante l'uso di solventi, osservare sempre le procedure di sicurezza idonee (ad esempio indossare bracciali ed abiti antinfortunistici) come descritto nella documentazione fornita con il materiale, specialmente in presenza di solventi tossici o pericolosi.

Simboli di sicurezza

Tabella 30 Simboli di sicurezza

Simbolo	Descrizione
	Questo simbolo segnala all'utente che è necessario consultare il manuale per l'uso per prevenire lesioni personali o danni alle apparecchiature.
	Indica la presenza di tensioni pericolose.
	Indica un terminale di messa a terra.
	Indica il rischio di lesioni agli occhi in caso di esposizione diretta alla luce prodotta dalla lampada al deuterio inclusa nel prodotto.
	Questo simbolo indica la presenza di superfici surriscaldate che non devono essere toccate dall'utente.

ATTENZIONE

L'indicazione ATTENZIONE

segnala situazioni che possono provocare lesioni fisiche o mortali.

- Prima di continuare a usare lo strumento, verificare di aver compreso e attuato quanto indicato nell'indicazione di attenzione.

AVVERTENZA

L'indicazione AVVERTENZA

indica situazioni che possono causare una perdita di dati o danni allo strumento.

- Non procedere oltre finché non è stato compreso ed eseguito quanto indicato.

Información de seguridad

Las siguientes precauciones generales deben aplicarse durante el funcionamiento, mantenimiento o reparación de este instrumento. Si no se cumplen estas normas o los avisos específicos que aparecen en diversas partes de este manual, se invalidan los estándares de seguridad de diseño, fabricación y utilización de este instrumento. Agilent Technologies no se responsabiliza del incumplimiento de estos requisitos por parte del usuario.

General

Éste es un instrumento de seguridad de Primera Clase (dotado de un terminal de toma de tierra) y ha sido fabricado y comprobado de acuerdo con las normas internacionales de seguridad.

Operación

Antes de conectar el instrumento a la red, siga atentamente las instrucciones de la sección de instalación. Además debe tener en cuenta lo siguiente.

No retire las cubiertas del instrumento mientras esté funcionando. Antes de conectar el instrumento, todos los cables de tierra, alargadores, transformadores y aparatos conectados al mismo, deben conectarse a tierra mediante un enchufe adecuado. Si se interrumpe la conexión a tierra, pueden producirse daños personales serios. Siempre que se sospeche que la conexión a tierra se ha interrumpido, debe dejarse el aparato inoperativo y evitar cualquier manipulación.

Compruebe que se utilizan los fusibles de recambio adecuados y del tipo especificado. Deben evitarse la utilización de fusibles reparados y los cortocircuitos en los portafusibles.

Algunos de los ajustes descritos en este manual deben hacerse con el instrumento conectado a la red y con alguna de las cubiertas de protección abierta. El alto voltaje existente en algunos puntos puede producir daños personales si llegan a tocarse estos puntos.

Siempre que sea posible, debe evitarse cualquier ajuste, mantenimiento o reparación del instrumento abierto y conectado a la red. Si no lo es, debe realizarlo personal especializado consciente del riesgo existente. No intentar llevar a cabo este tipo de trabajo si no está presente otra persona capaz de proporcionarle primeros auxilios, en caso necesario. No cambiar ningún componente con el cable de red conectado.

No ponga en marcha el instrumento en presencia de gases o vapores inflamables. El encendido de cualquier instrumento eléctrico en estas circunstancias, constituye un atentado a la seguridad.

No instale componentes que no correspondan al instrumento, ni realice modificaciones no autorizadas.

Los condensadores que contiene el aparato pueden mantener su carga aunque el equipo haya sido desconectado de la red. El instrumento posee voltajes peligrosos, capaces de producir daños personales. Extreme las precauciones cuando proceda al ajuste, comprobación o manejo de este equipo.

Cuando se trabaje con disolventes, seguir los procedimientos de seguridad apropiados (guantes de seguridad, gafas y ropa adecuada) descritos en las especificaciones sobre el tratamiento de material y seguridad que suministra el proveedor de disolventes, especialmente cuando se utilicen productos tóxicos o peligrosos.

Símbolos de seguridad

Tabla 31 Símbolos de seguridad

Símbolo	Descripción
	El aparato se marca con este símbolo cuando el usuario debería consultar el manual de instrucciones como protección contra el riesgo de dañar al operario y para proteger el aparato de daños.
	Indica voltajes peligrosos.
	Indica un terminal conductor protegido.
	Pueden producirse daños oculares al mirar directamente la luz producida por la lámpara de xenón, que utiliza este equipo.
	El aparato se marca con este símbolo cuando el usuario está expuesto a superficies calientes que no deberá tocar cuando estén a gran temperatura.

ADVERTENCIA

ADVERTENCIA

advierte de situaciones que podrían causar daños personales o la muerte.

- No continúe después de un aviso, hasta que no lo haya entendido perfectamente y se cumplan las condiciones indicadas.

PRECAUCIÓN

PRECAUCIÓN

advierte de situaciones que podrían causar una pérdida de datos o dañar el equipo.

- No continúe después de un mensaje de este tipo hasta que no lo haya comprendido perfectamente y se cumplan las condiciones indicadas.

安全に関する一般的な情報

以下の安全に関する一般的な注意事項は、本機器の操作、サービス、および修理のすべての段階で遵守するようにしてください。以下の注意事項またはこのマニュアルの他の箇所に記載されている警告に従わないと、本機器の設計、製造、および意図された使用法に関する安全基準に違反することになります。ユーザーがこれらの要件を守らなかった場合、アジレントでは本製品の信頼性を保証することはできません。

一般

本製品は、国際安全規格に従って製造および試験された、安全クラス I の装置（保護接地用端子付き）です。

操作

電源を投入する前に、設置方法が本書の説明に合っているかどうか確認してください。さらに、次の注意を守ってください。

操作中に装置のカバーを取り外さないでください。装置のスイッチを ON にする前に、すべての保護接地端子、延長コード、自動変圧器、および本装置に接続されている周辺機器を、接地コネクタを介して保護接地に接続してください。保護接地がどこかで途切れていると、感電によって人体に重大な危害を及ぼすことがあります。保護が正常に機能していないと思われる場合は、装置のスイッチを OFF にして、装置の操作を中止してください。

ヒューズを交換する際は、必ず指定したタイプ（普通溶断、タイムラグなど）と定格電流のヒューズだけを使用してください。修理したヒューズを使用したり、ヒューズホルダを短絡させたりしてはなりません。

本書で説明した調整作業には、装置に電源を入れた状態で、保護カバーを取り外して行うものがあります。その際に、危険な箇所に触れると、感電事故を起こす可能性があります。

機器に電圧をかけた状態で、カバーを開いて調整、メンテナンス、および修理を行うことは、できるだけ避けてください。どうしても必要な場合は、経験のある担当者が感電に十分に注意して実行するようにしてください。内部サービスまたは調整を行う際は、必ず応急手当てと蘇生術ができる人を同席させてください。メンテナンスを行うときは、必ず装置の電源を切って、電源プラグを抜いてください。

本装置は、可燃性ガスや有毒ガスが存在する環境で操作してはなりません。このような環境で電気装置を操作すると、引火や爆発の危険があります。

本装置に代替部品を取り付けたり、本装置を許可なく改造してはなりません。

本装置を電源から切り離しても、装置内のコンデンサはまだ充電されている可能性があります。本装置内には、人体に重大な危害を及ぼす高電圧が存在します。本装置の取り扱い、テスト、および調整の際は十分に注意してください。

特に、有毒または有害な溶媒を使用する場合は、試薬メーカーによる物質の取り扱いおよび安全データシートに記載された安全手順（保護眼鏡、安全手袋、および防護衣の着用など）に従ってください。

安全シンボル

表 32　安全シンボル

記号	説明
	危害のリスクを保護するために、そして装置を損傷から守るために、ユーザーが取扱説明書を参照する必要がある場合、装置にこの記号が付けられます。
	危険電圧を示します。
	保護接地端子を示します。
	本製品に使用されている重水素ランプの光を直視すると、目を傷める危険があることを示しています。
	表面が高温の場合に、この記号が装置に付けられます。加熱されている場合はユーザーはその場所を触れないでください。

警告

警告は、

人身事故または死に至る状況を警告します。

- 指示された条件を十分に理解してそれらの条件を満たしてから、その先に進んでください。

注意

注意

データ損失や機器の損傷を引き起こす状況を警告します。

- 指示された条件を十分に理解してそれらの条件を満たしてから、その先に進んでください。

一般安全信息

在仪器操作、维护和维修的各个阶段都必须遵循下列一般安全事项。不遵循这些安全事项或本手册中其他位置的特殊警告事项，将违反此仪器设计、制造和使用的安全标准。安捷伦科技对用户不遵守这些要求所造成的损失不承担任何责任。

一般说明

本仪器为 I 级安全设备（即提供保护接地端），并按国际安全标准制造与检测。

操作

通电前，应符合安装部分的要求。另外，还应遵循下列事项。

操作时不得卸下仪器盖。启动仪器前，所有接地保护端、外接线、自耦变压器及所连接的设备都必须经接地插座进行保护接地。任何干扰保护接地的因素都将导致潜在的电击危险，可能引起严重的人身伤害。保护设施可能受到损害时，必须停止仪器操作，并将仪器保护起来以防有意地使用。

确保只能用能够承受所要求的额定电流、并且为特定类型（正常烧断、时间延迟等）的保险丝进行更换。必须避免使用维修过的保险管 £¬ 而且要避免保险管套短路 ¡£

本手册中所述的一些调节是在仪器通电时和仪器的保护盖卸下时进行的。许多位置带电，一旦接触就可能造成人身伤害。

在仪器打开后，尽可能避免在通电时做调整、维护和维修。若必须进行上述活动，则应该由能意识到危险的技术人员进行。当现场不能提供紧急救护时，不要试图进行内部维护和调整。在电源线接通后，不要更换元件。

在有易燃气体或蒸气存在时，不要操作仪器。在这种环境下操作任何电气仪器都肯定会有危险。

不要在仪器上安装替换零件或对仪器进行未经授权的改造。

即使仪器已经断电，仪器内部电容仍有可能带电。本仪器内部有能造成严重人身伤害的危险电压。在处理、测试和调整仪器时应特别小心。

当使用溶剂时，尤其是使用有毒或有害溶剂时，请遵循溶剂供应商在材料处理和安全数据表中所述的相应安全规程 （例如戴上护目镜、安全手套，穿上防护衣）。

安全标志

表 33 安全标志

标志	说明
	对于标有此标志的设备，用户应参阅说明手册，以免对操作员造成伤害及仪器受到损坏。
	表示危险电压。
	表示受保护的接地端。
	表示用肉眼直接观察用于本产品的氘灯时，它所产生的光可能会损坏眼睛。
	如果存在较热表面，并且用户不应在加热后接触该表面，则仪器上会标有此标志。

警告

警告

警告您可能导致伤亡的情况。

- 除非您已充分理解并满足了指定的条件，否则请勿超越警告范围进行工作。

小心

小心

警告您可能导致数据丢失或设备损坏的情况。

- 除非您已充分理解并满足了指定的条件，否则请勿超越小心范围进行工作。

Setting Up a Test Sample Run

This instrument check demonstrates that the instrument is correctly installed and connected. Please use a fused silica capillary with 40 cm effective length and 50 µm inner diameter from the HPCE start-up capillary kit (part number **G1600-68700**) with the green alignment interface (part number **G7100-60210**). The instrument should be in CE mode.

Load chemicals from the Installation Qualification Chemical kit (part number **5063-6514**) according to the table below. The Installation Qualification Chemical kit contains:

- Buffer (20 mM borate, pH 9.3, 100 mL)
- Test sample (4-hydroxyacetophenone 1 mM, 3 mL)
- Conditioning solution (1.0 N sodium hydroxide, 100 mL)

Table 34 Solution for Checkout Run

Location	Solution	Volume
Vial 1	1.0 N sodium hydroxide	500 µL
Vial 2	Water	200 µL
Vial 4	Buffer	500 µL
Vial 5	Buffer	500 µL
Vial 6	Buffer	500 µL
Vial 7	Test sample	500 µL
Vial 8	Water/waste	200 µL

Choose the menu item **Method > New method** to prepare a method with the parameters given below. Save the edited method under a new name. Choose the menu item **RunControl > Sample Info...** and enter the operator name, directory and file name. Enter Vial location 7, enter sample name “1 mM pHAP” and click **Run method** to start the analysis.

A typical electropherogram will show a significant peak at a migration time of around 3 minutes.

Method Parameter CE (Default Settings)

Vials

- Inlet home vial 4
- Outlet home vial 5

Cassette Temperature

- 20.0°C

High Voltage System

- Enable high voltage
- Voltage 0.0 V (will ramp up in accordance with timetable)
- Current 300 µA
- Power 6.0 W
- Low current limit OFF

Stoptime

- 10.0 minutes

Posttime

- OFF

Replenishment

- Replenishment and preconditioning parallel processing
- No replenishment used

Preconditioning

CE Conditioning

- Flush inlet 1, outlet 8 for 5 minutes
- Wait 5 minutes
- Flush inlet 2, outlet 8 for 5 minutes
- Flush inlet 6, outlet 8 for 10 minutes

CE Injection

- Inject by pressure, 50 mbar, 4 seconds

Timetable

- Change voltage 0.2 minutes, 30 kV

Postconditioning

- No postconditioning used

Method Parameter DAD

Signals: Signal, Bw (nm) Reference, Bw

- Use signal A: Yes wavelength 325, Bandwidth 10, no Reference
- Use signal B: Yes wavelength 192, Bandwidth 4, no Reference
- Use signal C: Yes wavelength 235, Bandwidth 10, no Reference

Peak width

- > 0.1 minutes (2.0 s response time) (2.5 Hz)

Stoptime

- As with CE

Posttime

- Off

Spectrum

- None

Autobalance

- Prerun Autobalance

Lamps Required for Acquisition

- UV lamp

Timetable

- No entry

Chemical and Biological Safety

WARNING

Toxic and hazardous solvents

The handling of solvents and reagents can hold health risks.

- When working with solvents observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when using toxic or hazardous solvents.

WARNING

Pathogenic, toxic, radioactive samples and genetically modified organisms

If pathogenic, toxic, or radioactive samples are intended to be used in this instrument, it is the responsibility of the user to ensure that all necessary safety regulations, guidelines, precautions and practices are adhered to accordingly. This includes also the handling of genetically modified organisms. Ask your laboratory safety officer to advise you about the level of containment required for your application and about proper decontamination or sterilization procedures to follow if fluids escape from containers.

- Observe all cautionary information printed on the original solution containers prior to their use.
- Because leaks, spills, or loss of sample may generate aerosols, observe proper safety precautions.
- Agilent 7100 CE instrument covers have not been designed as bioseals for aerosols or liquid containment.
- Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of microorganisms. Some of the most virulent – Hepatitis (B and C) and HIV (I-V) viruses, atypical mycobacteria, and certain systemic fungi – further emphasize the need for aerosol protection.
- Always follow local state and federal biohazard handling regulations when disposing of biohazardous waste material.
- Handle all infectious samples according to good laboratory pocedures and methods to prevent spread of disease.
- Dispose of all waste solutions and products according to appropriate environmental, health and safety guidelines.

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC)

Abstract

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC), adopted by EU Commission on 13 February 2003, is introducing producer responsibility on all Electric and Electronic appliances from 13 August 2005.

NOTE

This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.

Do not dispose off in domestic household waste.

To return unwanted products, contact your local Agilent office, or see www.agilent.com for more information.

Radio Interference

Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with equipment unscreened cables and/or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure Lp < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

Legal Notice

The Agilent 7100 Capillary Electrophoresis System is sold for research only. By purchasing this instrument, the purchaser is granted the limited right to use only this instrument. Purchase of this instrument does not include any right, express or implied, to use any other patented product, method or process, or to use any other portion or component of any patented system or systems, software, microfluidic devices or reagents, either alone or conjunction with this product, unless use of such method, process or other portion or component is separately authorized.

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In This Book

This manual contains technical reference information about the Agilent 7100 Capillary Electrophoresis System.

The manual describes the following:

- introduction and specifications,
- installation,
- using and optimizing,
- troubleshooting,
- maintenance
- parts identification,
- safety and related information.

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